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CANADIAN MACHINERY AND MANUFACTURING NEWS

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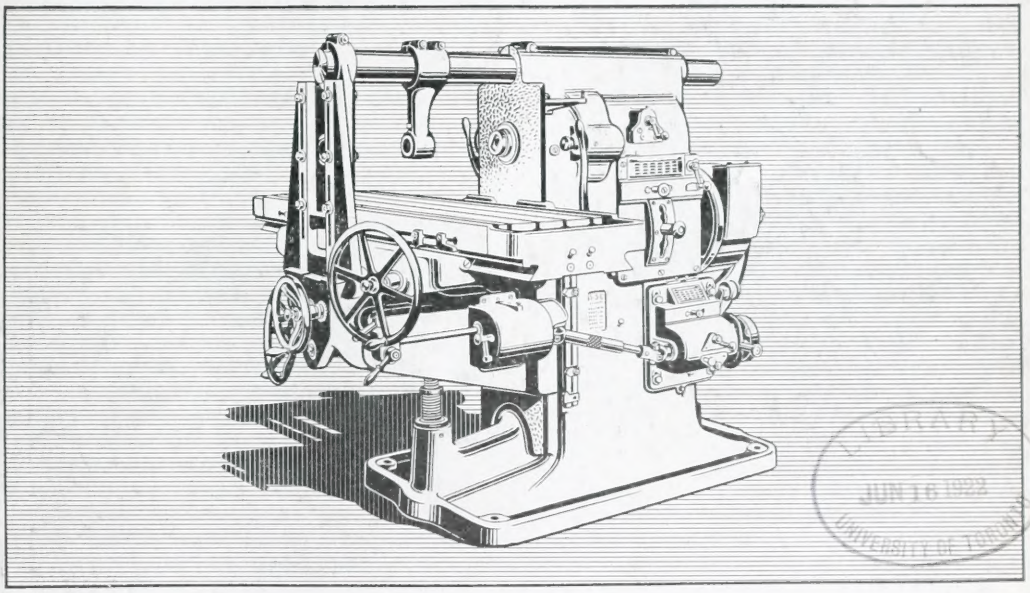

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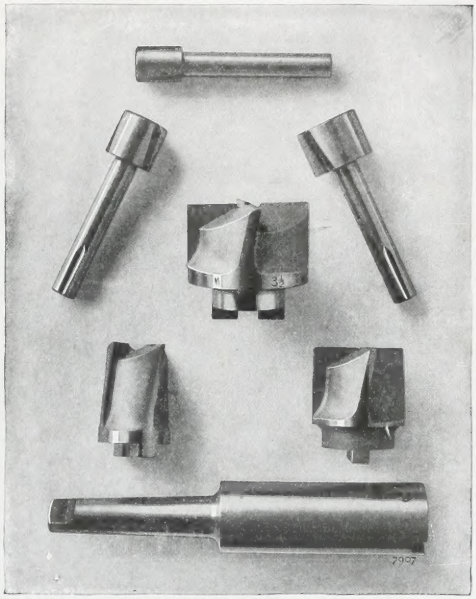

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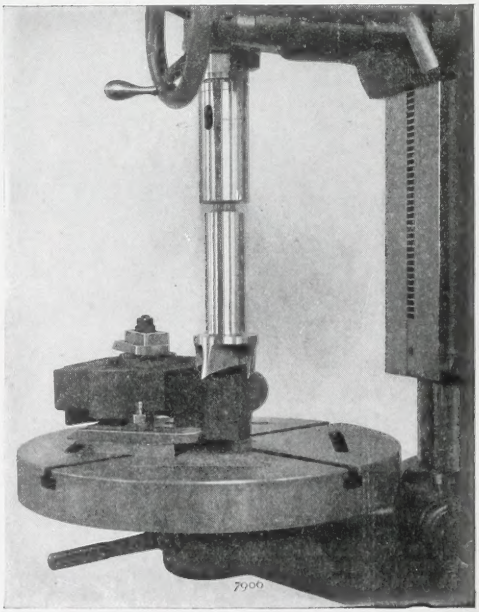

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The Publisher's Page

By B.G.N.

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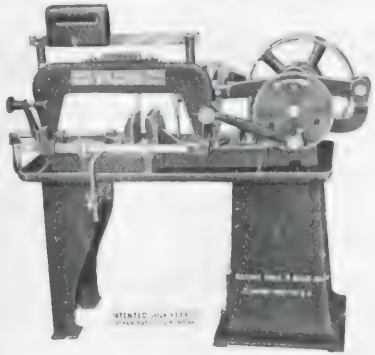

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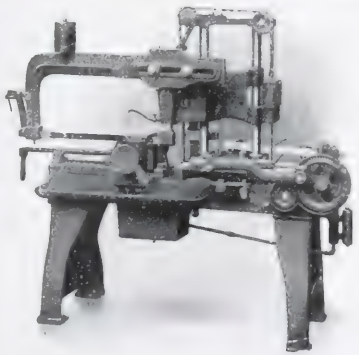

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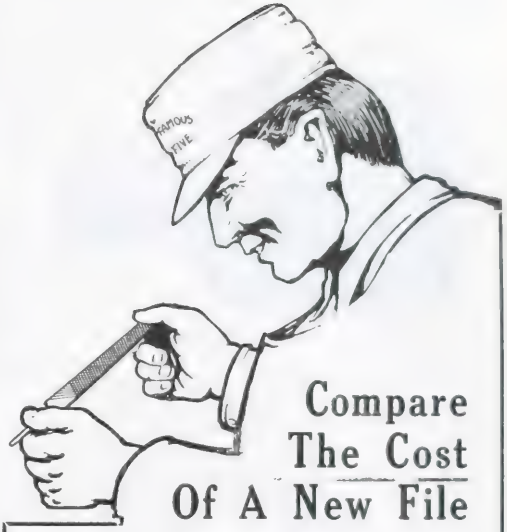

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From Illuminating Gas to Russian Shrapnel

A more complete transformation than that encountered in changing from illuminating gas manufacture to shrapnel shell production would be difficult to imagine. That such a change has been made, quickly and successfully is additional evidence of what can be accomplished to adapt our industrial resources to any required line of activity.

Staff Article

ALTHOUGH much has been written and said about the manufacture of shells in connection with the British War Office contracts, comparatively little has become known regarding French and Russian shrapnel, large orders for which are now in course of execution in this country.

While the various types of shrapnel are more or less similar in their general features, there are some points of design in which considerable divergence is noticeable.

The Lachine Manufacturing Co. of Lachine, Que., was the first plant in Canada to undertake the production of Russian shrapnel. This firm, who had been for several years manufacturing illuminating gas for various purposes, some time ago commenced the manufacture of Russian 3-inch shrapnel shells. Operations were at once commenced and such good progress made, that within four months they were working on the semi-finished product. When it is considered that buildings had to be erected and every tool secured and installed, it makes the achievement all the more remarkable.

The Building

The building is of solid brick construction, 112 feet by 100 feet and 25 feet high, with structural steel roof, covered with 1½-inch planking. The floor is of solid concrete. The shop is well lighted from three sides and also by a large sky-light extending the full length of the building; artificial light is supplied by 44 nitrogen lamps, being one 250 c.p. light for every 250 sq. ft. of floor space.

The building, which is steam heated, was completed in 15 days, and the time of laying the concrete floor was 3 days.

A general view of the machine section is shown in Fig. 1, while Fig. 2 is a plan of the machine layout.

Trimming End and Centering

The first operation on the rough forging is sawing off the open end. This is done in 4 Racine Tool & Machine Co. high-speed metal cutting machines. The shells are then taken to a 15¼-inch Carrol-Jamieson lathe, placed on a mandrel held in the lathe spindle, and the base of the rough shell centered.

Rough Turning

The third operation, rough turning the outside diameter, is performed on a Butler 22-inch gap lathe; one C. M. C. 22-inch gap lathe; 2 R. McDougall lathes, 22 inch gap and 20 inch, and two Rahn-Larmon 20-inch lathes. The shells are placed on a fluted arbor and the outside [illegible] length.

Facing Base

Facing off the base is the fourth operation; this is done on a 30-in. x 30-in. x 10-ft. C. M. C. planer, as shown in Fig. 3. The capacity of the machine is 80 shells per load. The shells are set up in the jig, and base roughed off (leaving 1-16 inch surplus stock over finished dimensions) with both heads working, and the shells removed in one hour and a half, which gives a total of 530 shells in ten hours. The general design of the jig can be clearly seen by referring to Fig. 4. The jig A is secured to the planer table and the gauge studs B are screwed into the base and locked by the nut shown. The shells C are then placed on the studs and clamped firmly up in the [illegible] of the jig by the clamps D.

Heat Treating

Tempering, annealing and scleroscope testing is the next operation. This is done in a room at the rear of the main building and the arrangement of the equipment is shown in Fig. 5. The two furnaces in the background are for hardening and tempering the shells, and were supplied by the Strong, Carlisle & Hammond Co. of Cleveland, Ohio.

FIG. 1. GENERAL VIEW OF MACHINE SHOP.

To the front of the hardening furnace is shown the quenching bath; the oil is kept in circulation by the pump overhead. The oil is drawn up through the pipe F into the pump, and forced through the pipe G, and the coil H and

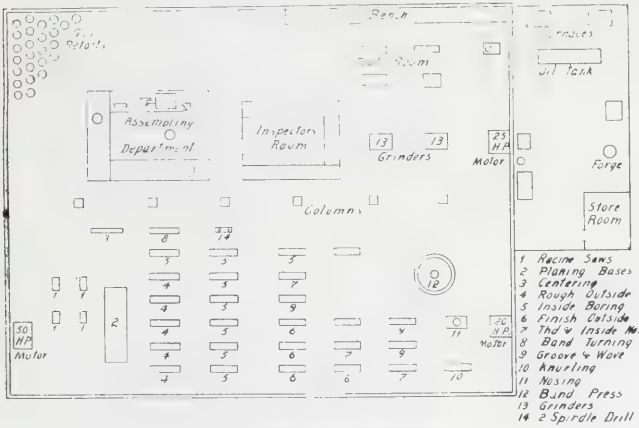


FIG. 2 LAYOUT OF MACHINES

shown at the top left-hand edge of the tank. The blower which supplies blast to the various furnaces is driven by a 10 h.p. motor, supplied by the Canadian Crocker-Wheeler Co. of St. Catharines. The furnace to the extreme right was installed for heating the nose in preparation to closing-in, but this was found unnecessary, as very satisfactory results could be obtained by closing the nose while cold.

Quenching Bath

A sketch of the quenching bath is shown in Fig. 6. Within the main tank A is placed the inner tank B which contains the oil for cooling the shells. This oil is kept in circulation by means of the pump E, which is driven from a shaft into the tank again at the opening I. This water in the outer compartment A is also kept in continual circulation, entering from the feed pipe J and overflowing from the discharge pipe K.

Inside Boring

After the shells have been heat treated and tested for hardness they are taken to the 6th operation, which is boring and forming powder chamber and diaphragm seat. The lathes on this operation are one Rahn-Larmon, one Walcott and Wood, 3 Boyé and Emmes and one Walcott; all of these are 20-inch engine lathes fitted with special turrets designed and constructed in the shop. These special turrets, which are giving excellent satisfaction, are used on a large number of the engine lathes in the shop, as the work in this plant is being performed without the aid of any standard make of turret lathe or machine.

The cycle of operations at this stage is chucking, rough bore, rough powder chamber and diaphragm seat, finish diaphragm seat and face off open end, rough taper and finish taper. This operation of roughing and finishing the taper bore is performed by solid reamers as shown in Fig. 7.

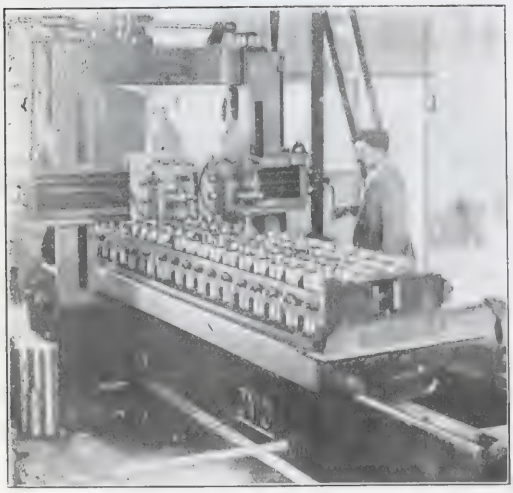


FIG. 3 FACING OFF BASES ON PLANER

Special Turret

Fig 8 shows a sketch of the special turret designed and constructed in the shop. The base A is secured in a central position on the lathe saddle; this base is recessed out to receive the revolving turret B, which is held in position by the ring C; this ring is secured to the base by the bolts D. In the bottom of the turret B six equidistant holes are drilled and a steel bush E inserted; the locating pin F is kept in position by the spring G. The lever I, pivoted at J, passes through the piece H, which is fastened to the lower end of the locking pin, F. The flow of the cutting compound is automatically controlled by the position of the turret, the liquid flowing only when operating tool is in position. The fluid enters the base of turret by means of the pipe K and flows through to the passage N, thence to the tubes O, which pass along a groove in the shank to the outer end of the various tools. To avoid any undue leakage, the leather washer Q is placed in a recess.

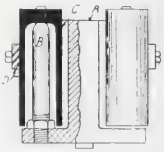


FIG. 4. JIG FOR HOLDING SHELLS ON PLANER

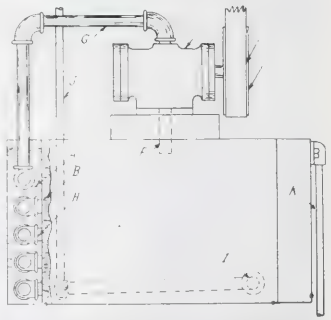


FIG. 6. ARRANGEMENT OF CIRCULATING PUMP AND COILS IN QUENCHING TANK

and bears upon the lower surface of the revolving turret B.

Self-tightening Chuck

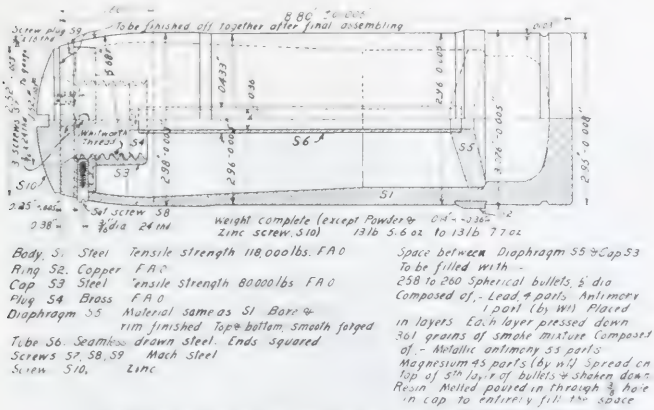
Fig. 8A shows a special self-tightening chuck used extensively in this shop. Body A is screwed on to the lathe spindle; collet B, which has three equidistant slots milled in the nose, is checked into piece A as shown. A tapered sleeve C formed of three pieces of hardened tool steel grips the body of the shell when chuck sleeve D is screwed upon body A. Any slippage of the shell in the chuck now causes collets B and C and sleeve D to turn, thus causing the tapered nose of sleeve D to tighten on

C and increase the gripping force accordingly.

Groove and Base Finishing

When the inside of the shells are finished, they are taken to two Rahn Larmon 20-inch engine lathes, where the copper band groove is cut, sides undercut, small groove for cartridge case is put in, base diameter finished below copper band groove, base faced and corner rounded. This operation is shown in Fig. 9; the turning and facing operations are performed by the tools held in the special four-sided turret tool box shown at the front of the saddle, while the undercutting of the groove faces are made by the device secured at the back end of the cross-slide. The ball-bearing hollow centre shown in the tail-stock spindle sup-

FIG. 5. VIEW OF HARDENING ROOM. HEATING FURNACES IN BACKGROUND.



RUSSIAN 15-PDR. SHRAPNEL SHELL WITHOUT FUSE NOSE.

ports the end of the shell while the groove is being turned. These special tools, as well as the expanding mandrel, were all designed and built by the superintendent and shell shop forman.

Undercutting Device

The device for undercutting the sides of groove is shown in sketch, Fig. 10. This is built of a flat plate provided with two grooves machined at the proper angle in which slide tool carriers A and B. These carriers have a number of rack teeth cut to engage with pinion C which when oscillated by the lever D brings either tool into operation as desired. Adjusting stops are provided at the outer end of each tool carrier as shown, and also a positioning stop for the shell.

Tool carriers A and B are a good close sliding fit in their respective grooves, and are retained in position by suitable keeper plates fastened to the main casting.

Knurling for Copper Band

It was originally intended to knurl the copper band groove at the same setting as that for turning, but owing to the great pressure required it was thought advisable to reverse the shell, thereby bringing the copper band groove closer to the head-stock bearing. The base of the shell is held in a special chuck and the open end run in a special centre in the tail-stock spindle.

During this setting the outside diameter, from the rifling groove to the open end, is finished turned to two diameters, the main portion of the shell being 2.96 inches diameter, while a short section back of the nose contour is left 2.98 inches; two Mueller 16-inch engine lathes are used for this operation.

Cold Nosing

The ninth operation, that of cold nosing, is performed on a Brown-Boggs No. 320A geared straight-sided press. As previously stated, it was thought that the open end of the shell would require heating to close the nose to the desired shape, but as the wall of the Russian shrapnel, at the open end, is lighter than that of the British shrapnel, and also requires less reduction in diameter, several shells were nosed cold and thoroughly tested; the result showing that the cold nosing, while being equally satisfactory in quality, is also much more economical.

Finishing the Nose

The nose being formed, the shells are taken to one 18-inch and one 20-inch Graves Classical engine lathes and one Rahn-Larmon 18-inch engine lathe; these lathes are fitted with the special turret as shown in Fig. 8. The sequence of operations on the nose are: finish outside contour, cut thread, form inside contour and face end to length. A point bearing

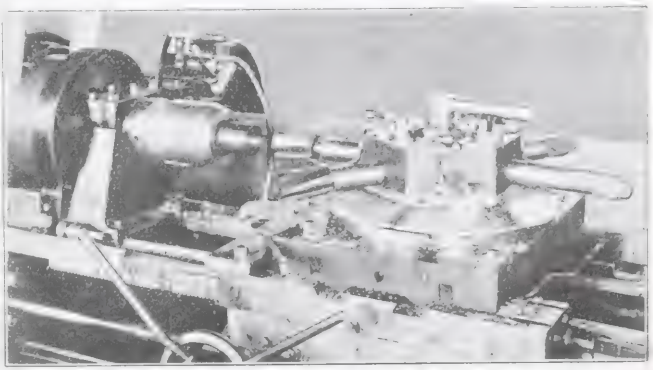


FIG. 7. SPECIAL TURRET FITTED TO ENGINE LATHE

the movement of the cross-slide while the contour of the nose is being formed.

Outside Grinding

At present the outside diameter is being finished by filing, but two Ford-Smith grinders are being installed to take care of this operation. The power required to run these grinders will be supplied from a single Crocker-Wheeler motor of suitable power.

Copper Banding

The shells are now ready to have the copper band put on. This operation is performed on a Canadian Fairbanks-Morse banding press.

The shells are held in a special chuck on a Greaves-Klusman 18-inch engine lathe while the copper band is turned, the base being supported in a special

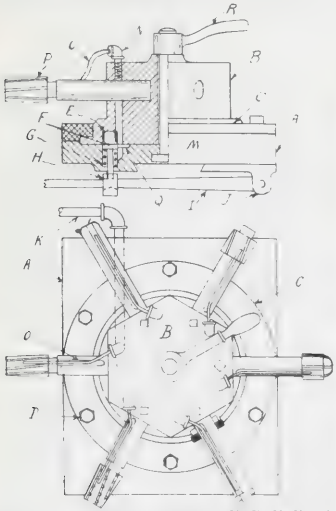


FIG. 8. SPECIAL TURRET FOR USE ON REGULAR ENGINE LATHES

ball bearing cap centre. This operation is shown in Fig. 11. The special chuck is secured to the lathe spindle, and to insure added rigidity is run in the steady-head shown; this steady rest has a bearing of babbitt metal. The shell is held by closing the split chuck by means of the two-piece clamp.

Painting

The shells are now taken to a paint spraying arrangement where the inside receives two coats. The diaphragms are also thoroughly coated by dipping in a bath of paint.

Assembling

The steel tube and diaphragm are then placed in position and taken to the tables shown in Fig. 12, where the charge of powder, bullets, resin, etc., is put in. The process of charging these shells differs considerably from that of the British shrapnel. When the tube and diaphragm

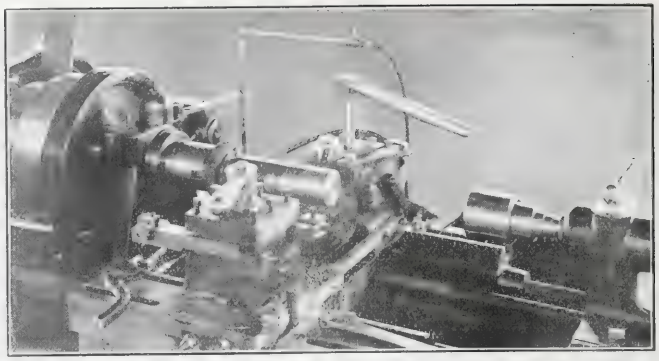


FIG. 9. CUTTING GROOVE AND FINISHING BASE ON SPECIALLY EQUIPPED ENGINE LATHE

are in position a charge of 90 bullets with a small quantity of smoke powder —13 drs. 5 grs. of 55 per cent. magnesium and 45 per cent. antimony—is placed in and pressed firmly down by means of

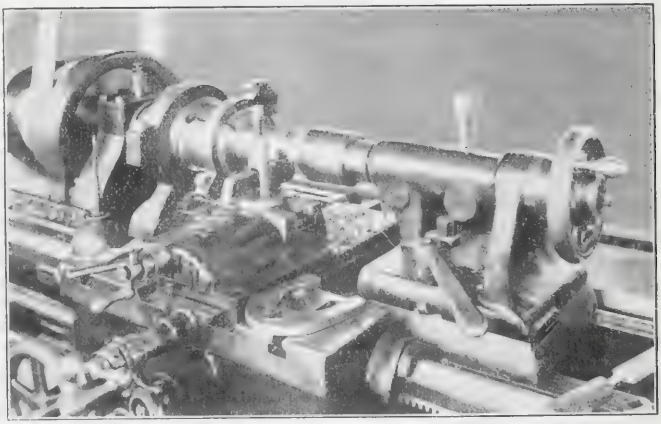


FIG. 11. TURNING COPPER BAND

the 20-ton Weaver screw press, shown to the right of Fig. 13; after this first charge of 90 bullets has been pressed in, a second lot of 50 bullets are poured in and pressed firmly down; a third lot of 50 is put in and pressed and a fourth lot of 50 similarly treated. This makes a total charge of 240 bullets.

To bring the shell up to the required weight it is necessary to add from 6 to 9 loose bullets as the specifications call for a charge of 240 bullets with a supply of 310 grains of smoke powder. A small quantity of heavy No. 1 petrolatum is used on top to hold the shot in position.

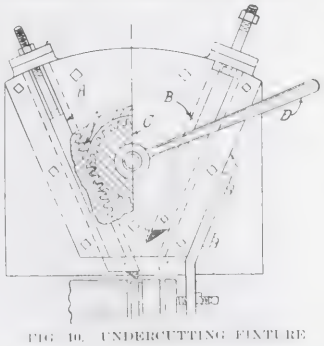


FIG. 10. UNDERCUTTING FIXTURE

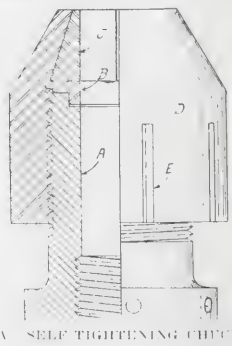


FIG. 8A. SELF TIGHTENING CHUCK

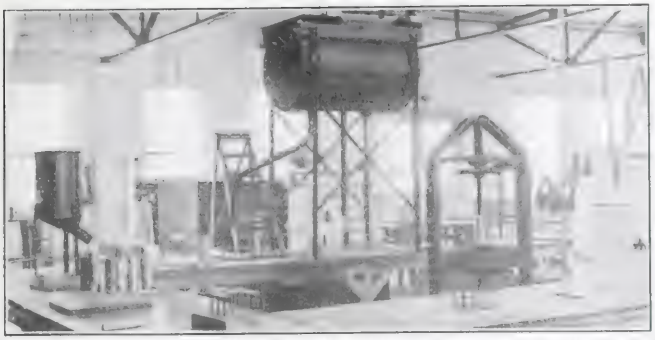


FIG. 12. [illegible] DEPARTMENT SHOWING BULLET HOPPER, POWDER TANK, LOADING PRESS AND RESIN FURNACE

Fixing Cap and Tube

When the correct weight of [illegible] as been obtained, the steel cap is screwed firmly into the nose of the shell. In place of [illegible] the powder tube to the cap [illegible] is done in the British shell a small brass plug is screwed firmly down upon the upper end of the tube.

Through the nose or socket are two tapped holes; a smaller air vent hole, and one of larger size, through which the melted resin is poured into the shot chamber; these holes are then plugged.

Shot Filling Arrangement

The arrangement of these various operations can be clearly seen in Fig. 12. The shot tank shown to the extreme left is filled with bullets, and the spout is so designed that a chamber at the mouth is enclosed in two slides. These slides will contain an average of 90 bullets at each charge. The large elevated tank shown in the centre contains another supply of bullets; the S-shaped pipe to the left ends in the filling arrangement which is shown in detail in Fig. 13. This device is so designed [illegible] bullets are taken from the feed pipe to the shell at each movement of the lever.

In the position shown, the bullets fall down through the pipe I into the piece F, which contains, when full, 50 bullets; the lever G is then swung over until the piece F is over the hole J in the lower plate B, when the bullets fall into the shell K placed below. The plate C, which is secured to the piece F, moves with it and closes the opening from the pipe I until the lever G is brought back to the previous position. The Weaver screw-press is seen in the foreground, and the resin tank is shown to the extreme right.

Powder Hopper

Midway between the two bullet tanks is the galvanized iron receptacle which contains the smoke powder that is placed in the shell with the first charge of 90 bullets. The small funnel-shaped measuring device is shown resting on the edge of the box. A sketch of this powder box and measure is shown in Fig. 14. The hopper is filled at B and the powder passes down into the box A where it is dipped out by the small measure F. The funnel or socket E, secured to the cover C, is used for removing the surplus powder from the top of the funnel F, which when filled level with the large end contains the exact quantity [illegible] powder.

Finishing Nose

When the shells have been filled and the cap and plug screwed in, three holes are drilled through the nose. These are tapped for 3-16-inch headless set-screws. Two of these are to secure the cap or socket, while the third is drilled and tapped through shell nose and cap to hold the time fuse in position.

The extending parts of the screws are then filed off and the nose of the shell and cap finished by polishing. The shells are then lacquered by applying lacquer with a brush while the shell is revolving between centres on a lathe.

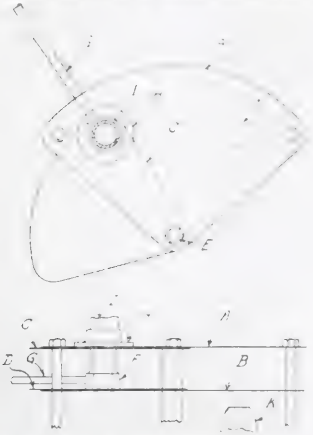


FIG. 13. BULLET MEASURING DEVICE

FIG. 14. POWDER TANK WITH MEASURE

All explosives, no matter what their base, depend upon nitric acid or nitrates. Common black powder contains saltpetre, which is nitrate of potash. Smokeless powders are nitrocellulose. The higher explosives are trinitroglycerine, trinitrotoluene, trinitrophenol, etc.

In normal times these are made from the actual nitrates, most of which comes from Chile. But the Chilean deposits have not sufficed to supply the enormous demand made by agriculture and the arts in recent years, and now that thousands of tons are needed for explosives, the demand has multiplied many times over.

Therefore, it has been necessary to draw nitrogen from the air, where it exists in inexhaustible quantities. Nitrogen at a high temperature combines with many other elements. This was discovered only a few years ago, but already more than $100,000,000 is invested in factories where the process is used for making nitric acids. The chief of these are in Norway, Sweden, Switzerland and Germany, in each of which countries there is an abundance of water power.

There are several processes, the earliest of which was invented by Birkeland and Eyd. It consists of making the nitrogen and the oxygen of the air combine by using the electric arc. This is the process used at Notodden, Norway, where 280,000 tons a year are produced.

By this process the gases have to be cooled to a very low temperature to prevent the bioxide of nitrogen from decomposition.

CALIFORNIA has the longest electrical transmission line in this country, a current of 150,000 volts being transmitted [illegible] miles, from Big Creek to Los Angeles.

Sheet Metal Elbows: Their Development and Laying Off-III

By J. W. Ross

In order to thoroughly understand the principles involved in the development of cylindrical and other forms, such as are met in sheet metal work, a considerable knowledge of geometry is desirable. Through the medium of these articles, the author places practical examples at the disposal of our readers, and the knowledge to be gained by a close and persistent study of the principles and methods employed will well repay the time spent.

ELBOW OF CLINKER COURSES

IN Fig. 14 is shown the elevation view of a five-coursed 120-degree elbow of ½-in. plate. This system of fitting the courses is generally termed "telescopic" plating; it should be more correctly called "clinker" plating.

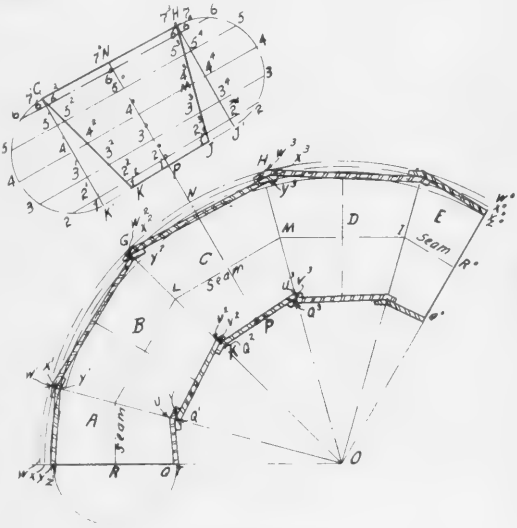
It will be observed that the end of one course fits over, whilst its other end fits in; thus each course will be [illegible] conical in form.

Many platers prefer to lay this out by triangulation, which is generally too slow for most problems. Again, some prefer approximate methods which certainly give a quick layout, but much time is wasted and the work generally poor, when the courses are being fitted and lined up for riveting, very often the holes being unfair and completely "blind."

The method given below of developing this type of elbow is much superior and quicker in every way than that of triangulation or approximate methods. Triangulation will be dealt with in a forthcoming issue. The student may then use the method suitable to his own ideas. It was stated that each course was conical; therefore, it will be developed on the principle as described for cones—that is, by radial lines. The method of constructing the elevation view is different to the preceding problems.

Measure off OR, Fig. 14, equal to 36 inches, and RQ, RZ each equal to 9 inches; thus the inside diameter of the elbow will be 18 inches at ZQ, Fig. 14. With O as centre and OR as radius, strike the arc RR°. Construct the angle ROR° equal to 120 degrees. Mark off YZ, YX and XW each equal to the thickness of the plate. With each of these points as radii to the centre O, strike in the arcs ZZ°, YY°, XX°, and WW°. The mitre lines are obtained as previously explained.

Each of the end courses equals one, and each of the intermediate courses equals two. According to the drawing, the courses A and E equal two, while BCD equals 6, making the sum of 8. Now, 8 divided into 120 degrees equals 15 degrees. By dividing the arc WW° into 8 equal parts and connecting these points by straight lines to O, the mitre lines are located. Draw RS at right angles to ZRQ. With the dividers set to the distance OS, mark off the points OL, OM, and O1 on the mitre lines. Connect these points by straight lines, as S to L, L to M, M to I and I to R°; these lines will be tangent to the arc RR°.



FIGS. 14 AND 15

To show a cross section of the plate thickness, connect Z to Y^1 and Y to X^1. Y^1 and X^1 are of course the intersections of the mitre line. So with the arcs YY° and XX_0. Similarly connect X^1 to Y^2 and W^1 to X^2; also proceed with the remaining lines that are drawn in, as shown on the arc ZZ°, YY°, XX°, WW°, Fig. 14.

The throat thicknesses are next drawn in. Mark off QT equal to the plate thickness. With dividers on S and distance SY^1 measure off SU^1, also SV^1 and SQ^1 equal respectively to SX^1 and SW^1. Connect Q to U^1 and T to V^1. In the same manner, with L as centre, the distances LY^2, LX^2, and LW^2 are transferred to LU^2, LV^2 and LQ^2 respectively. Connect V^1 to U^2 and Q^1 to V^2. Similarly proceed with the remainder of the construction.

By this method of construction, if the end courses EA were joined together they would conform to the courses B, C, or D. So if one of the intermediate courses is marked off, the end courses may be marked from the pattern.

The course C will, therefore, be developed; and to save confusion of the lines on this drawing the neutral lines of course C will be transferred over to Fig. 15. The heavy lines GHJK, Fig. 15, represent the neutral lines of course C, Fig. 14, or, which is equally the same, of the courses B and D. Parallel to the centre girth line PN draw from G the line GK^1, also from H the line HJ^1. Extend the line KPJ to the points K^1 on GK and J^1 on J^1H. Now, as will be seen, K^1GHJ^1 forms an ordinary frustum of a cone, so accordingly will it be developed. Bisect GK^1 at 4^1. With 4^1 as centre and 4^17—which is of course, the neutral radius—as radius strike the half-end view 147. Divide this into a number of equal parts and number accordingly. Project these points to intersect GK^1 at right angle. Bisect HJ^1 as at 4^1. With 4^1 as centre and radius 4^17, strike the half-plan view 147. Divide this into the same number of equal spaces, as in the view through GK^1.

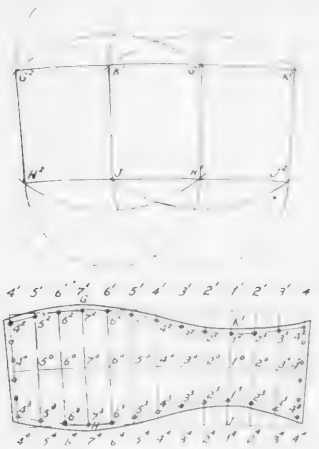
Number these points in the same consecutive order, and project lines from them to intersect HJ^1 at right angles. Connect points on GK^1 with corresponding points on HJ^1. The lines connecting these points will not be parallel, but will be radial, because HJ^1 is shorter than CK^1; GK^1, J^1K being part of a cone. Where these lines intersect the inclined lines GK and HJ, number as in Fig. 15.

For explanatory reasons only, the outline K^1GHJ^1 is transferred over to Fig. 16, as $J^1K^1G^1H^1$. With trammels or dividers on H^1 as centre and H^1K^1 as radius, strike the arc K^1K^2. With J^1 as centre and radius J^1G^1, strike the arc G^1G^2. With K^1 as centre, K^1G^1 as radius, strike the intersecting arc G^1G^2. Similarly with the same radius and G^1 as centre, strike the arc K^1K^2. Again, with K^1H^1 as radius, G^1 and K^1 as centres, strike the respective arcs J^1J^2 and H^1H^2. With J^1H^1 as radius and centres J^1 and

H^1, strike the intersecting arcs H^2H^1 and J^1J^2.

Draw an even curve through the points $G^2K^1G^1K^2$, Fig. 16, by the aid of a light wooden batten placed on the four points. In a similar manner draw in the curve through the points $H^2J^1H^1J^2$.

Again, for the benefit of instruction and to avoid a confusion of lines, Fig. 16 has been transferred over to Fig. 17, as shown by $4^14^14^1$ for the upper curve and $4^14^14^1$ for the lower curve. Measure off from and on each side of 4^1—of the centre line 4^14^1—along the curve 4^14^1 a distance equal to half the neutral stretchout of the diameter 1^71^7, Fig. 15, which equals half of $22 \times 3.14 = 34\frac{1}{2}$ inches. The total of the stretchout for $4^14^14^1$ will be 69 inches. Similarly the stretchout for the lower curve will be $56\frac{1}{2}$ inches; therefore, half of this stretchout measured along each half of the curve from the central point 4^4 will locate the whole stretchout as enclosed



FIGS. 16 AND 17.

by the points $4^14^14^14^1$. Divide 4^1 and 4^1 each into 12 equal spaces—that is, six spaces at each side of centre 4^1 and centre of 4^1, which is the number of spaces each half plan view is divided into in Fig. 15. These points on Fig. 17 are connected by straight lines and numbered accordingly. The curved centre line 4^0, 4^0, 4^0 is drawn equidistant to the curves $4^14^14^1$ and $4^14^14^1$.

As PN, Fig. 15, is equidistant from the inclined lines GK and HJ, therefore the distances 1^01^2, 2^02^2, etc., are equal respectively to 1^01^2, 2^02^2, etc. As both sides of the centre line PN are alike it will only be necessary to take one set of measurements to be transferred over to Fig. 17. These distances be measured from and at each side of the centre camber line $4^04^04^0$, Fig. 17.

Set the dividers to distance 1^01^2, Fig. 15; transfer this over to 1^01^2 and 1^01^3, Fig. 17. Proceed similarly by transferring over from Fig. 15 the distances 2^02^2, 3^03^3, etc., to Fig. 17, as 2^02^2, 2^02^2, 3^03^3, 3^03^3, etc. An even curve drawn through these points locates the rivet line and these points also indicate the rivet centres if desired. Divide the seam rivet lines 4^24^3, 4^24^3, each into the same number of rivet spaces. Twice the diameter of the rivet hole, measured from the rivet line, will give a suitable lap. For caulking purposes in water or steam-tight work, one and a half times the diameter of the hole will be more suitable for laps, the rivet holes, of course, being spaced according to the class of work.

Fig. 17 shows the complete pattern for courses B C and D. If the plate be cut on the line $4^04^04^0$, Fig. 17, the upper part would be the pattern for course E and the lower for course A.

MONTREAL HARBOR CONSTRUCTION WORK

AN inspection tour on October 18, by the three commissioners, Major David Seath, secretary; F. W. Cowie, chief engineer; M. P. Fennell, jr., and J. Vaughan, superintendent of railway terminals, revealed the fact that by the middle of next summer the permanent construction work of Montreal Harbor will be finished for that section of the port which stretches from McGill Street to the hay shed.

For some years the harbor work has been impeded to some extent by the very effort of the harbor authorities to bring the port up to an efficiency which would enable it to deal with the business which the West sends down to it. From next summer the problems of this part of the harbor will concern solely the administration of the facilities provided.

The commissioners on leaving their office proceeded to the place where the large addition to Elevator No. 1 is being constructed by the Fuller Construction Co. They expressed pleasure at the progress which had been made. The lower set of bins are now completed to the top, and the set on the shore side, which are about 19 feet higher, will be completed shortly. The whole thing will be covered in before the cold weather arrives, so that all through the winter work can go ahead with the installation of machinery and necessary interior work. The cupola will be on in a few weeks, and the commissioners were able to say after the inspection that the new building would be ready by the early summer of 1916.

Victoria Pier End

The commissioners also inspected the office building in its new position on the wharf, where it was moved to make room for the addition to Elevator No. 1. In the basement of this building the police department will be housed, as last year.

The last crib just put in place at the river end of Victoria pier has completed that pier, so far as its length is concerned. All that now remains to do is to build it up to the high level. Although this will not be accomplished this season, the work will be sufficiently advanced so that the winter ice will not damage it. Next year it will be finished in good time, and, when it is completed, Victoria pier will add about 2,500 lineal feet of harbor frontage to that available for ocean vessels, and 4,800 lineal feet along the inner side for lake and river vessels.

The commissioners and the departmental heads accompanying them afterwards proceeded by flat car along the higher level tracks of the harbor system down to the dry dock, to see what progress had been made with the filled-in land, and the extensions being made by the Canadian Vickers Co. The work done here has been little short of extraordinary, the activity being indicated by the fact that parts filled in only last summer are already built upon.

The party also traversed the high level tracks of the system, which have now been extended beyond Dominion Park, to connect ultimately with the Pointe aux Trembles wharf, built opposite the Canada Cement Co. premises. The flat car took the party almost down to Pointe aux Trembles, a sufficient indication of the progress of this extension of their railway system.

"Emden" Bombardment Effects.—An instance of the damage done to the German cruiser Emden by the Sydney's shots, states the Ironmonger, is to be found in one of the mementoes recently taken from the vessel. It is an oblong piece of metal, fairly smooth on one side, but on the other side presenting an appearance similar to that of a piece of jagged rock. It consists of a portion of the fireproof safe of the Emden and some silver dollars from a drawer of the safe. The explosion must have blown the dollars into the steel, and the heat of the flames which burst from the vessel shortly after the explosion melted the whole into a conglomerate mass of silver and steel. This gives a very clear indication of the conditions in those parts of the ship where the bombardment was most felt. It does not seem likely that much will be saved from those parts except for the melting pot or the foundry.

IT HAS been estimated that nearly fifty per cent. of the potential water power of this continent is available in the States of the Pacific Coast, or nearly twelve million horse-power.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

THE WORLD'S GREATEST ARSENAL

THE vast contracts received by various corporations in Canada and the United States have impressed most people by reason of the number of workers required to complete them, as much as by the value of the amounts involved. The fact that these contracts have been distributed over wide areas, has so detracted from their direct appeal to the general public, that an account of conditions pertaining in a restricted area like the valley of the River Clyde in Scotland is of absorbing interest to those of us engaged in munitions manufacture. The Glasgow Herald publishes the following particulars of wartime activity:

It must have been borne in upon every Clyde workman that the vast steel and shipbuilding area which exists between Motherwell and Dumbarton is one of the most extensive and important in the eyes of the nation. The Clyde area has become, indeed, the largest centre in the world for the production of war materials. This compliment is paid, notwithstanding the great developments which have taken place on the Tyne, at Barrow-in-Furness, Sheffield, Woolwich, etc. In the number of industries and the comprehensive scope of their productivity the Clyde has become the world's greatest arsenal. With the development of aircraft, too, the tendency must still be in favor of concentration on the Clyde and adjacent areas. The South of England is much too exposed to the menace of aircraft. Woolwich Arsenal and the Portsmouth and Devonport shipbuilding yards may be said to have seen their day. Once peace is concluded there will be an exodus for the north, where already some striking developments have begun in this direction, of which it is impossible here to speak. The Clyde is certain still more to outdistance all rivals in its importance as a naval and military centre of production.

Over 150,000 War Workers

It may surprise Clydesiders to discover the extraordinary number of men who are engaged locally in the shipbuilding and allied industries. At last census (1911) almost one-quarter of the males resident in Lanarkshire were engaged in such kindred trades. Lanarkshire's industries monopolized the labor of 212,482 mules. Miners occupied premier place with 56,209 men employed, while the steel trade had 20,168 workers, and the engineering shops required the services of 20,145, and shipbuilding 14,528—a gross total of 54,841 in the steel and shipbuilding trades alone. This excludes Dumbartonshire, Renfrewshire, and North Ayrshire, all of which impinge on the Clyde munition area. Since the war began new munition factories have been laid down in many districts within the area, enormous developments have taken place in shipyards, gunshops, etc. Adding the men within the Dumbartonshire and Renfrewshire sections, plus the men engaged in the new workshops and factories, there cannot be less than 100,000 workers engaged in the Clyde area today on Government work, while the number of females may be set down at 5,000.

The Wages Bill—£600,000 a Week

Taking the men's wages at £3—an average balance between the smaller earnings of the unskilled laborer and the fat earnings of the skilled worker, swollen by abnormal overtime—this gives an influx into the Clyde area of £300,000 weekly in wages for the men, and, at £1 10s per head, the females take £7,500. In many cases unprecedented wage bills have been earned. Young, energetic fellows, having their time-sheets marked double time for Sunday labor, etc., have been known to earn £7 10s in a single week, while many steadily earn from £5 to £6. It is stated that one Clydebank family of five or six sons, plus the father—all skilled workmen—is earning £40 weekly—which is at the rate of £2,000 a year.

The total sum distributed by the Government in prosecuting the war is £4,500,000 daily, or £31,500,000 a week. It is well-known that in warships and war material the wage bill represents about one-half of the total cost (on battleships the wage bill is actually 60 per cent. of the total). On this basis, Clyde industries are receiving a total of over £600,000 weekly. In other words, almost one-fiftieth of the money expended by the nations on the war is finding its way into Clyde channels. This is proof, again, of the enormous importance of the West of Scotland to the nation—and the Allies—in the prosecution of this gigantic struggle.

A Shipbuilding Record

Leading up to this present-day abnormal development, the Clyde had already been for a number of years the largest and most comprehensive war arsenal in the world. For a long period it had been the largest warship-building centre extant. On the Admiralty List were five yards capable of producing battleships, while no other centre possessed more than two. For a number of years prior to the war the Scottish river had constantly on hand, in varying stages of construction, as many as four battleships of the Dreadnought type, representing, with a host of auxiliary craft, as much as £17,000,000 of taxpayers' cash. When Mr. Churchill visited the district several years ago he declared there were as many ships then building on the Clyde as represented the total fleet of a second-rate naval power. Since the Dreadnought era began the Clyde has completed the following battleships and battle cruisers—a list which roughly constitutes one-fourth of the total number of capital ships under the command of Admiral Jellicoe—the Colossus and Ajax at Greenock; Conqueror and Benbow at Dalmuir; Inflexible, Australia, and Tiger at Clydebank; and the Indomitable and New Zealand at Fairfield. There are certain other ships, about whose construction nothing may be said, however.

A Self-Contained Area

But it is in the multiplicity of its establishments that the Clyde leads the world. A battleship may be produced and equipped in every detail, everything being manufactured locally. There are immense gun shops, gun mounting departments, armor-plate shops, shell factories ad lib., a torpedo factory, and torpedo-testing range. The explosive works in our midst are the largest in the world. Then there is the highly technical establishment which produces range finders for guns. Every Navy extant has received some of Glasgow's products in this department—the British of course securing the specialties exclusively. Not even organized Germany can show a single centre with such multiplicity of warlike productivity.

The honor of leading the Clyde in this gigantic development of becoming the greatest naval and military arsenal in the world belongs to the firm of Wm. Beardmore & Co. It is very well known that the Parkhead establishment produces all kinds of weapons up to the largest naval guns in use on his Majesty's ships. Included amongst these are weapons for sisters of the Queen Elizabeth, completing "somewhere" in this country. The firm began its gun department ten years ago, on the personal initiative of its present head, Sir Wm. Beardmore, whose enterprise in this and other directions has proved a lucky asset for the nation to-day. Prior to the guns the Parkhead works had acquired great repu-

tation for their armor-plate. This involves the most complex metallurgical problem undertaken by steel manufacturers; and here, be it said, the product of Messrs. Beardmore stands unrivalled throughout the world. It is not generally known that until recently nearly all the English firms were producing armor-plate did so on a process invented and patented by Krupps, of Essen, to whom a royalty of 10s per ton was paid for license to work it. Messrs Beardmore never used this process. They adhered to their own methods, and by costly experimentation evolved a plate which is superior to the Krupp.

Universal Providers

During the Russo-Japanese war it was an odd coincidence that vessels engaged on both sides had materials in their hulls or engines which had come from Parkhead. The Russian battleship Petropavlovsk, which was sunk by a mine outside Port Arthur, had materials—engine, shafting, etc.—which were manufactured at Parkhead; while the Japanese battleship, to name one only, the Shikishia, had plates which were produced in Glasgow.

Messrs. John Brown & Co., Clydebank, come next to Messrs. Beardmore in the importance of their products for war. They built the Japanese battleship Asahi, which formed part of the squadron under Admiral Togo in the Sea of Tsushima when the Russian fleet was completely annihilated. Several years ago when on a visit to Glasgow, the Japanese naval commander paid a special tribute to the fine work of the Asahi in the greatest naval battle since Trafalgar. Messrs. Brown & Co., have at present the superintendence in Russia of one of the Government yards, where our Ally's new fleet is being prepared. One of their great successes has been achieved in turbine engine construction, developing the American Curtis system, and they have been favored with many Admiralty vessels designed for fast steaming. The Tiger battle-cruiser, the fastest in the world, came from this yard soon after war broke out.

In order to compete successfully with the great armaments firms of Vickers & Company at Barrow, and Wm. Beardmore on the Clyde, Messrs. John Brown & Co., combined with the Fairfield Company and the Coventry Ordnance Company, laid down a splendid factory at Scotstoun some years ago for the purpose of completing gun mountings. Messrs. Beardmore's is the only establishment on the Clyde which can completely build and equip a warship, while Messrs. John Brown & Co., and the Fairfield yard come next a considerable distance behind, it must be admitted, in the multiplicity of their products and capacity to build and equip a battleship.

"BARGING ABOUT THE NORTH SEA"

WHEN Rear Admiral Sir Doveton Sturdee, on a recent occasion spoke of the British Navy as "barging about the North Sea" (says the "Scotsman"), all who heard him realized the measure of the Navy's regret that there had been so much difference between what it wished to do and what it had been given an opportunity of doing. To sweep the seas of the world clean of the surface craft of the enemy within a few months, to impose upon his commerce a strangle hold, to fight land batteries and cover the operations of troops on distant coasts, to smash a way up tropical rivers, and edge over the shoals of a flat coast-line with great guns working mightily for the sake of a few hundred yards, have been great achievements, but they have not satisfied the fleet. "The sure shield of Britain" has not failed her, and the utmost ingenuity of an absolutely unscrupulous enemy has been countered successfully and in silence. The whole world was made aware of the awful things which the German submarines would achieve, and now the whole world is aware that they have achieved practically nothing, and is almost imploring Britain to tell what she did to them. Such is the difference of method. The resounding phrases of the commission to the submarines of the enemy to "cleanse the North Sea" produced no evidence of disturbance over here. His underwater craft put out with injunctions of frightfulness showering upon them, and with impressed neutra's awaiting results, but they were just quietly gathered in, and the manner of their ending was a mystery to the Fatherland.

Opportunity Lacking

There has been lacking, however, the one great opportunity, as compared with which all the achievements indicated are recorded by the British Navy as nothing moment. The enemy's fleet has remained locked away behind the minefields, and there has been no smashing contest such as would result when the navies of nations fought. Deprived of the one test which it believes would be final—the British Navy is disposed to look upon all else that it has done as mere "barging about."

It has been said that "barging about" has included the reduction practically to impotence of the submarine service which the enemy had regarded as his most valuable arm. It has included much more than that. If it were possible, indeed, to tell all that "barging about" has meant, the gratitude and admiration with which the nation—and not alone this nation—would regard the Silent Service would be greater than ever. The earliest days of the war were during days at sea [illegible] now, and the lessons they provided have been well learned. Our Fleet at that time had yet to measure the infamy of the enemy, and to realize that to the German nothing was sacred but his success. There were some fine feats of seamanship during the first black, wild winter round coasts darkened and disguised, and amid courses mazed and mixed and falsified in "the blindfold game of war." Be it remembered that many of the ships of the Navy had been drawn across the world to the work on the lightless, shallow, narrow sea, where the enemy was assured that his mosquito craft from the harbors behind Heligoland would hunt at will. Sailormen will appreciate the seamanship which kept the ships in safety at their work, day and night, on such coasts, under such conditions. Efficiency and accuracy in the engine-room; efficiency, accuracy, and our heritage of "sea sense" on the bridge; these were the factors which, in darkness and storm, upset all the calculations of the enemy, and nullified all his efforts. The nerve of the Fleet was better, and the Fleet itself stronger, at the end of the winter than it had been at the beginning. The German calculation was that its nerve should have been gone, and the best of its ships destroyed. The strain only proved the quality of the Navy.

A "Tramp" Incident

There were many comparatively unimportant incidents of almost a year ago which at the time sent a grin round the fleet and did their part in the general hardening. These were connected, for the most part, with the attempts of the enemy to maintain [illegible] submarines. Many of our tars will recall one such incident which involved quite a feat of seamanship. It occurred out on the North Sea, and possibly a little west of the long Forties. Just about twelve months have gone since the affair, but it still raises a smile in certain quarters. A fast, light cruiser of our Navy on a very dull morning, after a calm, cold night, sighted a cargo vessel under a neutral flag, and came to regard her with some suspicion. The "tramp" was kept under observation for a long time before she received any evidence at all of being watched. To outside appearance, the neutral was in that condition which brings to his mouth the heart of a skipper expectant of salvage, and no doubt more than one trawler that morning had glanced at her hopefully, and again and again, for a signal that she had broken down and wanted a tow.

Lying off in the distance, the warship was satisfied that the tramp was not "going lame," but was waiting for something. Having arrived at that conclusion, the neutral was approached in

the usual way, and an examination was made. In the making of the examination the "gullible and unsuspecting" Britisher rather scored. The officer entrusted with that duty did not spend much time over it. That was not necessary. He was apparently satisfied as to the bona fides of the tramp when he shouted a cheery "Good-bye," and returned to his ship. His report was to the point. Whilst "looking at nothing" he had seen enough to be certain that the vessel was neither a neutral nor an innocent tramp steamer with a defect in the engine-room. The warship disappeared, and the tramp "limped" along, with no more than steerage-way on, as before. Throughout eleven weary hours patient eyes and ready guns were turned on that unsuspecting merchantman, and at length darkness fell. Then there was vouchsafed the watchers that for which they had waited so long—the combination of lights on the neutral. It was a clever combination, in which her ordinary lights played the part of permanent basis. Having learned all that she seemed likely to learn by waiting, and being now certain that anything that was about to happen to the cargo steamer would not be seen by any submarines that might be about, the warship made a move in the darkness. During the whole eleven hours the position of the suspect had hardly changed. The extra lights of the combination suddenly vanished on the tramp as the cruiser bore nearer, and that was the first indication to the invisible fighting ship that the crew of the tramp had heard the rumble of machinery somewhere and were taking precautions. Then an astounding thing happened. On the quarter of the tramp a section of the darkness materialized in the most startling fashion, and from it there poured over the merchant ship a crowd of sturdy fellows who dashed for the bridge and dived for the engine room and had the ship in their hands and her crew prisoners within five minutes. The cruiser, slipping up in the blackness had laid her long, slim bows alongside as sweetly as ever she laid them along a jetty, and the boarding party asembled forward did the rest. The crew of the tramp had no time to do anything in the way of warning anyone. It was smart work, and a valuable capture. Stores of food, drums of oil fuel, and spare torpedoes were carried under the sham cargo of the supply ship. She was steamed into port by her prize crew, and she steamed very well indeed. It is said that she steamed out of port again not long after, and that on resuming her interrupted duties with a new crew she exercised a distinctly demoralizing influence upon certain units of the submarine service of the enemy.

Beatty's "Boarding"

The feat at seamanship involved in laying the cruiser alongside her quarry so suddenly and so closely in the darkness was noteworthy, but on the occasion of the fight at racing speed between our battle cruisers and those of the enemy, off the Dogger Bank, last January, there was provided a no less notable example of the splendid skill with which the fighting ships are controlled. It will be remembered that when the Lion dropped out of action, Admiral Beatty transferred his flag to the Princess Royal. The Princess Royal, steaming at full power, was using her guns with effect upon the fleeing enemy, without intermission. To recall her from that work in order that the Admiral might get on board was apparently not thought of. She had to be overtaken, not recalled. To catch her the Admiral boarded the Attack. The destroyer was asked to overtake a battle cruiser which was running at well over 30 miles per hour and to put the Admiral on board without delay. The Attack was "opened out" to the task, and it may be questioned if even her designers dreamt of the speed she developed. The Princess Royal was overhauled, but kept on her furious way, her guns crashing out unceasingly. Steadily the Attack worked closer, and very soon, with engine-room responding with marvellous precision to the demands of the bridge, she was reduced in speed to enable her absolutely to cling to the speeding leviathan ahead of her, and with both vessels rushing along at that terrific pace the Admiral passed from the destroyer to the battle cruiser and resumed his place in the action.

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GUNMETAL: ITS COMPOSITION AND APPLICATIONS

THE following is a short summary of an article recently published in the "Foundry Trades' Journal":

The compositions which come under the heading of gunmetal include chiefly the following:

Copper	Tin	Zinc
88	11	2
88	11	1
87	8	5
87.5	6.25	6.25
84	12	4

The first of these is the recognized Admiralty steam metal, the second is used for general admiralty work, the third is for propellers, the fourth for bolts, and the fifth is a well-known metal for bearings. In making gun-metal, the copper should be melted first at a fairly rapid rate in a good fire, a cover of broken glass or powdered charcoal being used to protect from the atmosphere or from furnace fumes. When the metal is molten, the tin should be added, and finally, just prior to pouring, the zinc, the temperature then being raised slightly to overcome the chilling effects of the addition. A small piece of phosphor-copper used as a deoxidiser adds fluidity and aids soundness. The great essential in Admiralty specifications is purity of raw materials; the copper used should not contain more than 0.25 per cent. of arsenic, nor the zinc more than 0.25 per cent. of lead. Care must be taken not to overheat the metal in the furnace, nor to keep it at full heat for any longer time than is necessary; the molds must be ready when the metal is ready. The maximum temperature of pouring may be taken as 1,300 deg. Cent., and the aim should be to bring out the metal at this heat in order that it may enter the mold at not less that 1,100 deg. Cent. The rate of pouring should be more rapid than with iron; in fact, the metal should be poured as rapidly and fully as possible. Gun-metal being a somewhat sluggish metal, it is well to flush the mold by pouring extra metal through to clears away any gases which are liable to be entrapped.

The molds may be either green-sand or dry-sand. Much small work can be cast in green-sand, but if difficulty is experienced with blow-holes, it is advisable to dry the molds, and this is frequently done in larger work, as the trouble may be due to gases created in the molding blowing through the metal to escape. These gases are, of course, practically removed during the drying process, and there is only the contained air in the mold to be attended to. An open-grained sand usually obviates this trouble. Holes due to the liberation of dissolved gases are only dealt with by more careful melting or by changing the copper for a purer brand. In order to allow rapid pouring, the gates should be ample. Parts to be machined should be cast down; as any oxide present works to the top. The sand used in moulding should be of open texture and drier than is used for iron. The molds should be well rammed and well vented.

⚙

TO MAKE a permanent cement used for stopping leaks in steam pipes, where caulking or plugging is impossible, mix black oxide of manganese and raw linseed oil, using enough oil with the manganese to bring it to a thick paste; apply to the pipe or joint at leak. It is best to remove pressure from the pipe and keep it sufficiently warm to absorb the oil from the manganese. In twenty-four hours the cement will be as hard as the iron pipe.—Locomotive Engineering.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

TRANSFER TRUCKS

IN order to meet the demand for a thoroughly efficient transfer truck of low cost, the George P. Clark Co., Windsor Locks, Conn., have placed on the market the two models illustrated.

FIG. 1. TYPE WN30 TRUCK FRAME DEPRESSED

Type WN30 shown in Figs. 1 and 2 is adapted for loads from 500 to 1,000 lbs. The frame is made of channel steel, is designed to raise 17½ in., and is fitted with

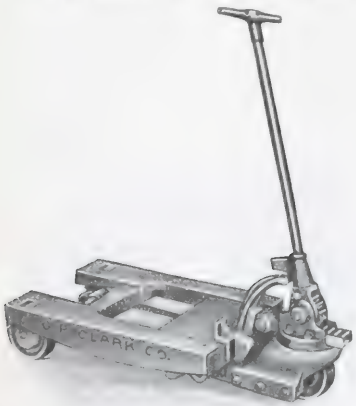


FIG. 3. TYPE YN10 TRUCK FRAME DEPRESSED

three wheels 6 in. diameter by 2 in. face having roller bearings and steel axles.

Fig. 1 shows the truck with the top frame in its lowest position with the lifting link resting on the front rod ready to elevate the frame. When the handle is pulled forward the top frame is swung upwards on the supporting links to its maximum elevation, when the lifting link can be unhooked from the rod by pressure of the operator's foot on the front end of the link which projects forward of the handle.

The platform which straddles the frame in the usual manner may now be transported to its destination and lowered by reversing the operations. This type is made in two sizes each having a capacity of 1,000 lbs., and taking a maximum size platform of 32 x 32 inches, and 42 x 32 inches respectively. These trucks weigh 130 lbs. and 140 lbs., the minimum height from floor to top of frame being 6 inches in both sizes.

A heavier type of truck for maximum loads of 2,200 lbs. is shown in Figs. 3 and 4. These are of substantial construction being built of malleable iron and steel, and of such proportions as will insure rigidity in use. The axles are of steel, the iron wheels 6 in. x 2 in. with dust proof roller bearings, and hardened and ground rolls and sleeves.

The elevating gear consists of combination cam-gears, the necessary movement being obtained by means of an anti-friction rack connected to the neap swivel and operated by the handle of the truck. The rack in the neap swivel moves only when the handle is swung away from the anti-friction roll, consequently the neap swivel can be turned completely around, which is of advantage when it is desired to move the truck with frame depressed.

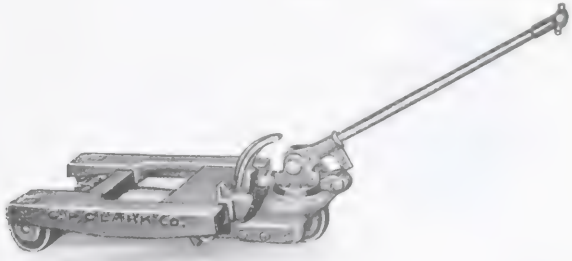


FIG. 4. FRAME ELEVATED

The combination cam-gears provide a rolling lift which reduces lifting stress to a minimum. When elevated, the upper frame is positively locked in position by the sliding wedge, either of which is sufficient to hold the load elevated, while they cannot be disengaged except by raising the handle and again lowering it. All work of elevating or moving the truck is performed by the handle which is rigidly pivoted to the neap swivel.

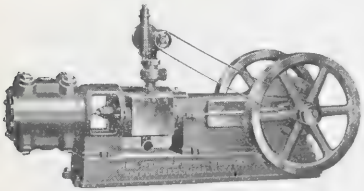
FIG. 2. FRAME ELEVATED

This truck type YN10 is built in four sizes, all having a minimum height of 6 inches with a lift of 2 inches. The maximum platform sizes vary from 32 x 32 inches to 52 x 38 inches, and the weights from 225 to 275 lbs. respectively.

ENCLOSED AIR COMPRESSORS

THE constant demand for increased efficiency in plant equipment of all kinds has been met with corresponding effort on the part of builders. Air compressors are one line of manufacture which has been the object of consistent effort.

Creek, Mich., build a full line of compressors which embody all that is desirable in modern air compressor design. These machines are of both vertical and horizontal types, and are adaptable to

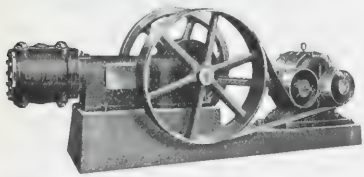


STEAM DRIVEN FLYWHEEL COMPRESSOR

all drives. They are built with open frames as well as enclosed, and also duplex single-stage, and two-stage.

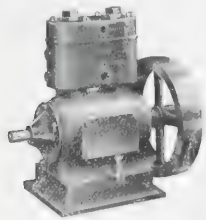
Enclosed construction, as shown in the illustrations, completely protects all running parts from grit or dirt, and enables the splash system of lubrication to be adopted. Access to the various parts is obtained through suitably placed cover plates.

Air valve design has received all the attention which this important feature



COMPRESSOR WITH MOTOR BELT DRIVE

deserves, and the flat steel-disc valve as developed by the makers is the result of many years' experience. This valve has a very small lift accompanied by freedom from noise, and its period of service is



VERTICAL DUPLEX COMPRESSOR

indefinitely lengthened by the use of special heat-treated steel in its construction.

In addition to the types illustrated, there is also manufactured a line of single cylinder vertical compressors from 3 x 3 inch to 6 x 6 inch, all of the water cool type.

SHRAPNEL SAND BLASTING MACHINE

SAND blasting shrapnel shells so as to thoroughly clean them externally and internally has found considerable favor. The apparatus here illustrated and described is a product of the W. W. Sly Mfg. Co., Cleveland, Ohio. The table of this machine has six shell pockets. Three of these are in the blasting department, and the other three as shown in the illustration are in the open. Thus, while three of the shells are being cleaned, the operator can remove the other three that have been cleaned, replacing them with three more to be blasted. Constant operation is thereby attainable.

The apparatus when connected to an exhaust system is claimed to be nearly dustless and absolutely automatic in operation. All sand used falls into an elevator boot and is elevated by means of buckets into a storage hopper, from whence it is returned by gravity to the three nozzles shown. The sand is in this way used over and over again, until it becomes so fine that it is practically useless for its purpose.

All parts of the machine which are subject to wear are enclosed with sheet iron, and not exposed to the sand blast. On the sand blasting table proper it will be noted that the division plates are lined with wood to protect the steel plate. The wood is inexpensive and easily replaced. The only parts which are subject to wear are the nozzles, which may be replaced at a slight expense.

Each nozzle is provided with an air nozzle which is not subject to wear, and has a constant opening so that the air consumption does not increase during operation. The standard air nozzle has a ¼ in. opening, which can be increased or decreased to suit conditions and the amount of air available.

The machine is designed so that the copper band groove and the upper part of the exterior of the shell are blasted by separate nozzles. When necessary to blast a small portion of the interior of the shell, the apparatus can be arranged to do so. Its capacity for continuous running is from 150 to 200 shells per hour.

The speed of working and the peculiarly clean surface obtained by means of sand blasting, combined with the absence of danger, due to scalding when using wash tanks, etc., commend this machine to all shell manufacturers who aim at producing the best quality of work with the least possible amount of rejections.

SHRAPNEL SAND BLASTING MACHINE

DURANT COUNTING MACHINES

AS the result of a regrettable error, the description appearing October 21st of the new model counting machine made by the Durant Manufacturing Company, of Milwaukee, Wis., was accompanied by an illustration of an entirely different article. The discrepancy, while sufficiently obvious to our readers, is

MODEL "D" DURANT COUNTER

inexcusable, and in reproducing the correct illustration of the Durant Model "D" Counter, we tender our apologies to both the Durant Company and the makers of the article, which was inadvertently illustrated.

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Vol. XIV. NOVEMBER 4, 1915 No. 19

PRINCIPAL CONTENTS.

SHELL COMMITTEE RECONSTITUTION

SHELL [illegible] the "immediate emergency" stage, it naturally followed, if the efforts of our metal-working plants continued to be requisitioned, that something more akin to a commercial basis for the distribution of future contracts [illegible] indicate progress in such a direction.

We are not of those who seem to see an investigation of the Shell Committee work looming up, and much less still would we expect to find, as a result, a series of unsavoury [illegible]

not want to.

[illegible] altogether impossible for either official British expert [illegible] account of that country's neutrality. We were therefore [illegible] the gracious position of aiding materially in our Empire struggle, and incidentally of helping ourselves.

The personnel of the Shell Committee had of necessity to consist of both a civil and a military element, and as regards the former—the most severely criticized, it would [illegible] our prominent manufacturers or their representatives who found a seat in its councils.

The Shell Committee appreciating the responsibility laid upon them, took no chances, of course, in placing contracts. Shell orders, even small as they were at first, did not come to us simply to give opportunity to experiment. Shell shipments were urgently required and shipping dates might be stated to have been the very essence of every contract.

Like every other big issue to be met—the "Message to Garcia," or "Shells to Britain," the men on whom the onus was laid took it as a personal matter, and staked their manufacturing reputations on the enterprise. They let contracts at the start-off to just such firms as their personal knowledge and experience warranted. It is therefore assuming nothing, much less making endeavor to mitigate what spiteful criticism dubs an indiscretion, when we say that manufacturers' representatives on the Shell Committee, were in every sense justified in sharing the bulk of the initial contracts among the firms in which they were interested.

Regarding prices paid for shells in Canada, much ill-advised criticism is being directed against the Shell Committee. A substantial price was in the earlier stages paid for the work; this has not, however, been maintained. It was but reasonable that a good margin should be provided our machine shops, not only to allow them to install the necessary equipment, but to make haste slowly towards success.

D. A. Thomas has been here to find out just what stage of productivity we have reached; to find out if we have taken advantage of the good margin price to install and equip, or to find out if we have simply temporized. He has got all data of that nature together, and the No. 1 firms—large and small are going to participate soon in the distribution of larger than ever shell orders and larger than ever shells. The best answer to all requests for a commission of investigation and the best opiate for the friction gossip is that D. A. Thomas has seen to the former and is satisfied, and that the latter in consequence does not exist.

The Shell Committee is being reconstituted, because Britain is now in a position to spare men with expert knowledge to co-operate with us in the work. Further, some of our manufacturing representatives are only too glad to again get opportunity to give their whole attention to the particular enterprises with which they are connected. The association of Brig.-Gen. Bertram and Lt.-Col. D. Carnegie, at least, with Lionel Hichen and R. H. Brand as the administrative board of the new Shell Committee, will express publicly Mr. Thomas' appreciation of the sincerity of purpose with which the civil section of the old committee carried out its work, and at the same time commend the high-degree achievement which it realized.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$14 70
Lake Superior, charcoal, Chicago	15 75
Ferro Nickel pig iron (Soo)	25 00

	Montreal.	Toronto
Middlesboro, No. 3	$24 00	.....
Carron, special	25 00	...
Carron, soft	25 00	.
Cleveland, No. 3	24 00	.....
Clarence, No. 3	24 50	....
Glengarnock	28 00	....
Summerlee, No. 1	30 00	....
Summerlee, No. 3	29 00	...
Michigan charcoal iron	28 00	.....
Victoria, No. 1	24 00	21 00
Victoria, No. 2X	23 00	21 00
Victoria, No. 2 plain	23 00	21 00
Hamilton, No. 1	23 00	21 00
Hamilton, No. 2	23 00	21 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.35
Steel bars, f.o.b., Toronto	2.35
Common bar iron, f.o.b., Montreal	2.35
Steel bars, f.o.b., Montreal	2.35
Twisted reinforcing bars	2.35
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	1.50
Tank plates, Pittsburgh	1.50
Beams and angles, Pittsburgh	1.50
Steel hoops, Pittsburgh	1.60
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.40
Small shapes	2.65
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.25
Structural shapes	2.50
Plates	2.30

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal.	Toronto.
Plates, ¼ to ½ in., 100 lb.	$2 25	$2 25
Heads, per 100 lb.	2 50	2 45
Tank plates, 3-16 in.	2 60	2 45

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$12 25	$12 25
Copper, crucible	14 25	14 00
Copper, unch-bled, heavy	14 25	13 50
Copper, wire, unch-bled	14 25	14 00
No. 1 machine compos'n	11 50	11 50
No. 1 compos'n turnings	10 25	10 00
No. 1 wrought iron	10 00	9 50
Heavy melting steel	8 50	9 50
No. 1 machin'y cast iron	13 50	12 00
New brass clippings	11 00	11 00
No. 1 brass turnings	9 00	9 00
Heavy lead	4 60	4 50
Tea lead	$ 3 50	$ 3 50
Scrap zinc	10 50	9 50

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Aug. 27, 1915:

	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
Standard				
¼, ⅜ in.	63	38½	....	....
½ in.	68	47½	....	....
¾ to 1½ in.	73	52½	....	....
2 in	73	52½	69	48½
2½ to 4 in	73	52½	72	51½
4½, 5, 6 in.	....	....	70	49½
7, 8, 10 in.	....	....	67	44½
X Strong P. E.				
¼, ⅜ in.	56	38½	..	....
½ in.	63	45½	....	....
¾ to 1½ in.	67	49½	....	....
2, 2½, 3 in.	68	50½	....	....
2 in.	....	....	63	45½
2½ to 4 in.	....	....	63	48½
4½, 5, 6 in.	....	....	66	48½
7, 8 in.	....	....	59	39½
XX Strong P. E.				
¼ to 2 in.	44	26½	....	....
2½ to 6 in.	....	....	43	25½
7 to 8 in.	....	....	49	20½
Genuine Wrot Iron.				
⅜ in.	57	32½	....	..
½ in.	62	41½	....	....
¾ to 1½ in.	67	46½	....	....
2 in.	67	46½	63	42½
2½, 3 in.	67	46½	66	45½
3½, 4 in.	....	....	66	45½
4½, 5, 6 in.	....	....	63	42½
7, 8 in.	....	....	60	37½

Wrought Nipples.

4 in. and under	77½%
4½ in. and larger	72½%
4 in. and under, running thread	57½%

Standard Couplings.

4 in. and under	60%
4½ in. and larger	40%

MILLED PRODUCTS.

Sq. & Hex. Head Cap Screws, 60 & 10%	
Sq. Head Set Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in. N.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake copper, carload	$20 00	$19 50
Electrolytic copper	20 00	19 25
Castings, copper	19 25	19 00
Tin	38 00	39 00
Spelter	18 00	17 50
Lead	6 50	6 25
Antimony	35 00	35 00
Aluminum	60 00	60 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer ,billets, Pittsburgh	$25 00
Openhearth billets, Pittsburgh	26 00
Forging billets, Pittsburgh	40 00
Wire rods, Pittsburgh	32 00

NAILS AND SPIKES.

Standard steel wire nails, base	$2 60	$2 55
Cut nails	2 50	2 70
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	2 85	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	70-10
Stove bolts	80
Plate washers	40
Machine bolts, ⅜ and less	65-10
Machine bolts, 7-16 and over	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35
Nuts, square, all sizes	4c per lb. off
Nuts, hexagon, all sizes	4½c per lb. off
Iron rivets	72½
Boiler rivets, base, ¾-in. and larger	$3.75
Structural rivets, as above	3.75
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75 p.c. off
Wood screws, flathead, Bronze	70 p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	....
7 in	2.38	7 in	3.81	....	....
8 in	2.50	8 in	4.34	....	....
8 in	2.88	9 in	4.90	....	....
9 in	3.45	10 in	5.48	....	....
10 in	3.20	....	....	....	....
10 in	3.50	....	....	....	....
10 in	4.12	....	....	....	....

COKE AND COAL.

Solvay Foundry Coke	$6.25
Connellsville Foundry Coke	5.65
Yough. Steam Lump Coal	3.83
Penn. Steam Lump Coal	3.63
Best Slack	2.99

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	30%
At warehouse	5%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS.

Solder, half-and-half	0.23
Putty, 100-lb. drums	2.70
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.15
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.20
Benzine, single bbls., per gal.	0.21½
Pure turpentine, single bbls.	0.80
Linseed oil, raw, single bbls.	0.77
Linseed oil, boiled, single bbls.	0.80
Plaster of Paris, per bbl.	2.50
Plumbers' Oakum, per 100 lbs.	4.25
Lead Wool, per lb.	0.11
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal.	0.73
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.65
½ in.	4.40
9-16 in.	4.05
⅝ in.	4.30
¾ in.	4.15
⅞ inch	3.65
1 inch	3.45

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre Drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS.

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	50

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 25 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 60 per cent.; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 75; malleable, lipped unions, 65.

TAPES.

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 00	$2 85
Canada plates, dull, 52 sheets	3 15	3 75
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	5 50	4 80
Queen's Head, 28 B.W.G.	6 00	5 95
Fleur-de-Lis, 28 B. W. G.	5 75	5 75
Gorbal's Best, No. 28	6 00	6 00
Viking metal, No. 28	5 25	5 25
Colborne Crown, No. 28	5 70	5 80
Premier No. 28	5 10	5 00

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$14 25	
1¼ in.	14 25	
1½ in.	14 25	
1¾ in.	14 25	
2 in.	14 25	9 25
2¼ in.	15 50	10 50
2½ in.	16 50	11 50
3 in.	21 00	12 25
3½ in.	24 00	14 50
4 in.	29 50	18 50

Prices per 100 feet, Montreal and Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	0 11
X Grand	0 10½
XLCR	0 09¾
X Empire	0 09
X Press	0 08¼
COLORED.	
Lion	0 07½
Standard	0 06¾
Popular	0 06
Keen	0 05½
WOOL PACKING.	
Arrow	0 16
Axle	0 11
Anvil	0 08
Anchor	0 07
WASHED WIPERS.	
Select White	0 08½
Mixed Colored	0 06¼
Dark Colored	0 05¼

This list subject to trade discount for quantity.

BELTING RUBBER.

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, sgle. and dble	50%
Standard	50 & 10%
Oak leather facing, No. 1	$1.20
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

¼ in.	$9.00
⅜ in.	6.55
5-16 in.	5.20
½ in.	4.75
7-16 in.	4.00
⅝ in.	4.00

Prices per 100 lbs

PLATING CHEMICALS.

Acid, boracic	$ 15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper sulphate	.10
Cobalt Sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.22 to .25
Tin	.45 to .50
Silver	.55 to .60
Zinc	22 to .27

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.50 to 1.75
Polishing wheels, bullneck	.80
Emery in kegs	4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.05 to .07
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Que., Nov. 1, 1915—Conditions generally in the steel and metal markets show some improvement over last week. Quotations on many products have been advanced and are very firm. The shell industry continues to develop and the heavy demand for steel for munitions is keeping the mills operating at capacity. Indications point to a considerable increase in tonnage.

Preliminary investigations are being made with a view to establishing an ordnance factory at some central point. Sir Frederick Donaldson and General Mahon have been visiting several mills and shops with the object of ascertaining if these plants can be utilized for making parts of guns. A large number of tenders have been received for the new eighty-million dollar shell order, and contracts will likely be distributed during the present week. With the reorganization of the Shell Committee, the production of shells will be stimulated.

Steel Market

The steel industry is still taxed to the utmost trying to meet the continued demand for bars and billets. Orders for 6-in., 8-in. and 9.2-inch shells are expected to be placed this week and this will call for production of a larger tonnage of billets for the forging of these shells. Some progress has already been made by a few of the larger plants on the forgings for these shells, and it is expected that little delay will be experienced in making the necessary preparation for the machining operations.

Machine Tools and Supplies

Little change is noted in the machine tool situation. The delay in delivery is one of the chief drawbacks to the shell makers. Delivery at a specified date is very uncertain, and with the increased demand for tools, caused by the placing of new orders for shells, is expected to complicate rather than relieve the situation.

The prospect of a demand for heavy tools, suitable for the manufacture of heavy projectiles of the 6-in., 8-in. and 9.2-inch type, will open a new field for the tool builder.

Sheets

The present indications show a tendency to higher quotations on dull and bright sheets, which may go into effect at any time. Demand for black sheets for early delivery has increased somewhat and the demand for galvanized sheets has also improved. Large enquiries are being made for blue annealed sheets. An advance in sheets is expected shortly.

Metals

Quotations on the various metals show little change over that of a week ago, with the exception of tin and lead, both of which have advanced. Rumors of a heavy demand for copper from Europe for war purposes is causing producers to anticipate an advance in price. Quotations are unchanged this week.

The increase in tin appears to be caused by the apparent scarcity of this metal, which is, by general indications, somewhat exaggerated. Little improvement is noted in the consumption and no change in the visible supply.

Spelter at present is steady, but may advance before the close of the week.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Lead has shown a small increase within the last few days, but the general market is little changed from a week ago.

Old Materials

The prices on scrap metals are holding firm; slight advances are noted, with prospects of further increases shortly.

Toronto, Ont., Nov. 2.—The industrial situation continues to improve, and the marked increase in production is shown by the development in the export trade. Exports already far exceed in value the imports for corresponding periods, and there is every indication that this tendency will continue for several months. As a result of the war, Canadian manufacturers are producing many articles which were previously imported. This should prove a permanent benefit to the country and increase the number of industries in Canada. In addition, outputs have considerably increased in products which have been manufactured in Canada for some years, thus assisting materially in consolidating the position of the industries affected. The value of orders for articles purely for war purposes has already reached a large total and will increase considerably. The Dominion Customs revenues for the month of October increased by two and one-half million dollars over the corresponding month last year, and in the seven months of the fiscal year the increase was nearly fifty-three million dollars.

The reorganization of the Shell Committee is proceeding quietly, and will probably be completed very shortly. The prospective development in the shell industry and extension of the powers of the committee render this step desirable. The committee in future will to all intents and purposes be directly responsible to the British Minister of Munitions. Tenders for 6 in., 8 in., and 9.2 in. high explosive howitzer shells have been submitted by several firms, and contracts will be awarded at an early date. The possibility of establishing an ordnance industry in Canada is under consideration. Experts are engaged in obtaining the necessary data as to the firms which might be able to manufacture parts of guns to be assembled later in a large central plant under Government supervision.

Steel Market

Extraordinary activity prevails in the steel market and the demand for steel for munitions continues to increase. The production of steel rounds has reached a heavy tonnage and mills have all the business they can handle. The Algoma Steel Co. is the latest concern to take up this class of work, they having secured an order through J. P. Morgan & Co. for 30,000 tons of rounds, while other contracts involving 20,000 tons of rounds have been closed. The contracts for the larger calibre shells, which will be placed shortly, will call for a considerable increased production of steel.

Conditions in the galvanized sheet trade are still somewhat unsettled. Owing to the increase in the price of black sheets and the possibility of higher prices for spelter, galvanized sheets have an upward tendency, although there is no change in prices to be noted this week. Black sheets are strong, No. 28 gauge being firmly held at $2.10 Pittsburg basis for early delivery, and mills are refusing to sell for extended shipments.

The steel trade in the States is in a very satisfactory condition. There is no abatement in the demand for various lines of steel, which is in excess of the producing capacity of the mills. Makers are still unable to meet the heavy demand for large rounds for shells, and the mill capacity is sold up months ahead. In addition to steel rounds, there is a good export demand for barb wire, forging billets, blooms and wire rods. The continued heavy demand for billets is forcing prices upward. Bessemers billets are now quoted at $25, open-

hearth billets $26, and forging billets $40 base f.o.b. Pittsburg.

Pig Iron

The situation in the pig iron trade is improving, and prices are stiffening. The consumption of low phosphorous iron is increasing, and there is also a better demand for foundry iron.

Old Material

The market is quiet, but prices are firm. There is not much demand for old metals except heavy melting steel, which is strong. Prices on scrap copper are unchanged, and there is a fair demand.

Machine Tools

Great interest is being manifested in the machine tool trade over the contract for the larger calibre shells, which will be awarded shortly. These shells are 6 in., 8 in. and 9.2 in. and weigh 180, 250 and 290 lbs. filled, respectively. Heavier tools will, therefore, be required than are being used for the 18-pdr. Lathes with 24 in. and 30 in. swing will be in good demand, although considerable difficulty may be experienced in getting delivery this year on new equipment. Quicker delivery is obtainable on second-hand lathes, and the market for this class of equipment will be stimulated. It is reported that some contracts for the large shells have already been placed, but no official statement has been issued as yet.

Supplies

Business continues active in machine shop supplies, and prices are very firm. The lines in greatest demand consist of chucks, taps and dies, drills, belting and belt fasteners, cutting compounds, etc. Prices of high-speed twist drills are still withdrawn, and quotations are subject to immediate acceptance. The high-speed tool steel situation is unchanged, stocks are very low and prices continue to advance. A sharp advance of 10c is to be noted in turpentine, due, it is said, to a shortage of supplies at Savannah. Turpentine is being quoted in Toronto at 80c per Imperial gallon. Prices of solders have advanced ½c, due to the strength in the tin market. Quotations on benzine have been adjusted; the new price is 21½c per gallon in barrels.

Metals

The market is holding steady, and, with the exception of an advance in tin, there are no price changes to note. The copper market is still very quiet, and the buying movement has not started, although it is anticipated that there will be one shortly. Spelter is higher in London, but unchanged locally. Lead is stronger, and will possibly advance. The antimony situation is unchanged, and prices are holding firm. There is a continued scarcity of aluminum, and supplies of this metal are almost unobtainable. The situation in the metal market locally is unchanged, and trade reports show business as being brisk in metals for munitions.

Tin.—A very active demand for spot and near-by tin has had a favorable effect on the market. There is, however, no improvement in actual consumption and so change in the visible supply. It is doubtful, therefore, if the advance is justified by conditions. Tin has advanced 2c, and is now quoted at 39c per pound.

Copper.—There is no change in the situation; the market is quiet, and there is little business doing. It is reported that producers are in control of the market—which indicates a possibility of higher prices. Local quotations are firm and unchanged at 19½c per pound.

Spelter.—The London market has advanced, but it has not affected New York, except to make that market firmer. The market is uncertain, and consumers are inclined to defer buying, except those making munitions, until the situation clears up. There is every possibility that the demand for spelter for galvanizing will increase, as the substitutes which have been tried have not proved a success, and there is also a possibility of the demand for sheets increasing. Local prices of spelter are unchanged and firm at 17½c per pound.

Lead.—The "Trust" have advanced the price of lead $3 per ton to a basis of $4.90 New York. Local prices, however, are unchanged meanwhile. There is a continued big demand for lead, and the position is a strong one. Local quotations are very firm at 6¼c per pound.

Antimony.—There is no improvement to be recorded in the market for antimony, which is under the control, for all practical purposes, of [illegible]. There is a tremendous demand for this metal, and English makers have practically ceased to export any except to the Dominions, and then only for munitions. Quotations are firm and unchanged at 35c per pound.

Aluminum.—[illegible] and has an upward tendency. There is [illegible] scarce and difficult to obtain. Local quotations are entirely nominal at 60c per pound.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Messrs. S. Ruperti and Alexsieff, care Military Attache, Russian Embassy, Washington, D.C.

CANADIAN TRADE RETURNS

THE total Canadian trade for the six months of the fiscal year ending September 30 last was well over half a billion dollars, according to the official statement issued by the Hon. J. D. Reid, Minister of Customs. The figures show a very satisfactory advance over the corresponding six months of 1914, which were $500,[illegible],000, as against $[illegible],000 for the six months just ended, or in round figures a total increase of trade of 59 millions of dollars.

The trade for September just ended was as follows: Merchandise entered for consumption, $38,026,000; domestic exports, $46,129,000, or a total of $84,156,000. This is a considerable advance on September, 1914, when the imports were $36,567,000, and the domestic exports $31,796,000, or a total of $68,364,000.

[illegible] September was very heavy—reaching a total of $9,244,000, compared with $5,188,000 for September, 1914. Of agricultural products, $11,139,000 worth were exported last September, as against $7,478,000 for the corresponding month last year. The export of domestic animals and their produce was also heavy—being $10,188,000, against $7,063,000 for September, 1914.

It is interesting to note there is a substantial increase in the export of domestic fisheries for the month of September, the total being $2,750,000, against $1,900,000 for September, 1914.

The importation of free goods for September last was $15,746,000, compared with $13,991,000 for September, 1914. For the six months ending September last Canada imported of free and dutiable goods, $213,588,000. During the same period she exported $246,392,000, so that our value of exports were considerably greater than our imports.

On the whole, the showing is a very satisfactory one ,the duty collected for the six months just ended being $44,418,000, compared with $42,857,000 for the corresponding period of 1914.

WAR BENEFITS CANADIAN TRADE

JUDGING by detailed trade figures published by the Department of Trade and Commerce, the war is having a good, rather than an injurious effect upon Canadian trade. For the six months ending with September of this year, Canada's total trade in merchandise was $486,966,000, or $18,440,000 more than it was for the corresponding six months of last year, for the most part under antebellum conditions. While imports of merchandise during the past six months show a relative decrease of thirty-eight millions, exports of Canadian produce show an increase of sixty-five millions. Exports of foreign products, however, show a decrease of some ten millions.

Figures for the month of September show that even in imports there is now beginning to be an increase, compared with last year, and although the September increase of $1,459,000 may in part be attributed to the unsettled conditions of September last year, immediately following the outbreak of the war, it is believed that it reflects in large measure the definite turning of the tide, pointing to renewed business confidence, replenishment of stocks in Canada, and a steady up-grade tendency in regard to the country's ability to pay for its imports through the increased volume of its exports.

For September, exports totalled $46,129,000, an increase of $14,333,000 over September of last year. Of this increase four millions is credited to manufactures, three millions to animal produce, and five millions to agricultural produce. As for the balance of trade, it is interesting to note that the total exports for the past six months have been $246,000,000, as compared with total imports of $213,000,000.

The value of war orders to Canada in stimulating exports is seen especially in the figures in regard to manufactured exports. For the past six months the total value of manufactured articles exported has been $71,476,000, or $39,559,000 more than for the corresponding months of last year. The increase is more than 100 per cent.

For the full twelve months ending with September last, the aggregate trade in merchandise was $935,254,000, a decrease of $64,809,000 as compared with the preceding twelve months. Imports totalled $417,472,000, a decrease of $114,000,000, while exports of merchandise totalled $474,000,000, an increase of $40,000,000.

DOMINION REVENUE SHOWING INCREASE

THE Dominion revenues for the month of October so far indicate a further substantial increase and the monthly statement is expected to be a most satisfactory one. This evidence and others emphasize the growing strength of the financial position of Canada as a result of the special measures resorted to since the outbreak of the war. There is every probability that the revenue estimate given to Parliament by the Finance Minister in his last budget will be more than realized.

The restoration of a normal situation as regards exchange between the United States and Canada is also affecting beneficially the affairs of the Dominion. The flotation of the $45,000,000 Canadian loan in New York in August and the sale in New York of sterling bills drawn against shipments of Canadian wheat to Great Britain and Europe have brought exchange on New York back practically to par. This is a marked improvement over the situation of three months ago, when the American dollar was worth more than the Canadian dollar, and a premium of one-half to one per cent. in Canadian money had to be paid for funds in New York.

The loan, in addition to stabilizing exchange between Canada and the United States, helped sterling exchange also by providing Canada with funds which otherwise would have been obtained in London. In addition, it conserved the gold reserves of Canada and paved the way for the Anglo-French loan.

It is learned here that the proceeds of the loan were not brought to Canada at once, but were withdrawn gradually so as to gradually reduce the exchange. The Finance Department made over $36,000 in exchange in the transfer of the money.

RECORD OF COPPER PRODUCTION

IT IS announced from New York that the present output of copper by smelters as well as by refiners, is record-breaking, just as it is in steel; but the entire production of copper is not being taken up, as is the case with crude and rolled steel.

During September, it is conservatively estimated that there was a surplus of 30,000,000 pounds in producers' stock in this country. This is based upon an estimated total consumption of 125,000,000 pounds. As the exports were approximately 35,000,000 pounds, this would leave 90,000,000 pounds for domestic consumption. Estimates of melting by domestic consumers range from 80,000,000 to 100,000,000 pounds, but it is doubtful that there is capacity enough to consume 100,000,000 pounds per month, even with the recent extensions made to manufacturing plants.

The total production of blister copper in September is estimated at 165,000,000 pounds, but the refined output is said to have been 5,000,000 to 10,000,000 pounds less; thus it is indicated that there was an increase in smelters stocks of about 10,000,000 pounds, as well as an increase of 30,000,000 pounds in stocks at the refineries.

CANADA'S TRADE WITH GREAT BRITAIN

THE following are the official figures of trade between Great Britain and Canada in the undermentioned articles during September:

	Sept. 1915	Sept. 1914
Exports from Canada.	£	£
Wheat	956,572	2,213,733
Wheatmeal and flour	143,422	87,604
Barley	220,399	46,654
Oats	9,316	115,189
Bacon	250,916	137,955
Hams	21,313	99,815
Cheese	342,055	634,833
Canned salmon	85,069	36,699
Canned lobsters	27,063	43,823
Imports to Canada.		
Spirits	31,023	49,101
Wool	34,086	11,056
Pig iron	17,823	1,945
Wire	544	5,969
Galvanized sheets	6,780	5,898
Tinned plates	2,988	6,344
Steel bars	7,701	7,138
Pig lead	3,266	3,569
Cutlery	9,423	9,300
Hardware	1,790	5,742

PROMISING OPENINGS FOR CANADIAN TRADE

THE Export Association of Canada, acting under the auspices of the Canadian Government and the Canadian Manufacturers' Association, met in London, England, to inaugurate a co-operative movement to extend Canadian trade, especially in countries where German commercial influence has hitherto been predominant.

F. C. Armstrong, joint general manager, presided. The gathering included representatives of the Canadian Car & Foundry Co., the Dominion Bridge Co., the Canadian General Electric , the National Steel Co., the Dunlop Tire Co., the Northern Electric, the Canadian Rubber Co., the Dominion Steel Corporation, the National Steel Car Co., the C. P. R., the G. T. R., and the C. N. R.

The speeches indicated a most promising opening of Canadian trade with Russia, Serbia, Italy, France and other parts of Europe, and also Great Britain. There was a general agreement that Canadian manufacturers and merchants should profit by the example of the Germans, so successfully set before the war, by methods of close co-operation in national interests between producers and railways and steamship companies, to secure the lowest possible freights. An

executive committee was formed to organize a vigorous campaign.

CANADIAN TRADE WITH OUTSIDE COUNTRIES

COMPARATIVE figures of customs revenue contributed by the different provinces are furnished by the annual report of the Customs Department just issued and covering the last fiscal year. Ontario leads with $33,218,000 collected in duties, Quebec comes next with $22,919,000. The revenue from other provinces was as follows: British Columbia, $7,373,000; Manitoba, $6,413,000; Nova Scotia, $2,930,000; New Brunswick, $2,162,000; Alberta, $2,484,000; Saskatchewan, $1,356,000, and Prince Edward Island, $160,225.

Quebec takes first place in exports. In the fiscal year they totalled $181,982,000 compared with $167,685,000 for Ontario. New Brunswick is third on the list with $54,322,000.

Imports from Germany during the fiscal year 1913-14 aggregated $14,500,000. In the year ended March last they fell to $5,000,000. Goods from the United States show an increase, being $428,000,000 compared with $410,000,000 in the previous year. Imports from the United Kingdom declined from $132,000,000 to $90,000,000.

On the other hand, Canada exported to Great Britain $211,000,000 worth of goods and to the United States $215,000,000 worth. There is likewise an increase in exports to France which grew from three million in 1913-14 to fourteen millions in 1914-15.

A small trade was done with Spain. Exports to that country amounted to $489,000 and imports $977,000. Italy took two millions worth of goods from Canada last year and we imported $1,472,000 worth. Two million dollars of exports were sent to Germany in 1914 before war was declared and all trade suspended. To Australia our exports were five and a half millions, to the West Indies nearly six and a half millions and to Newfoundland $4,481,000.

Manufacture of Guns Contemplated

It is believed in Ottawa that the manufacture of heavy guns in Canada is practically assured as the result of the investigation made by Sir Frederick Donaldson and Gen. Mahon, but that the British experts are not disposed to encourage a venture on so large a scale as was contemplated at the conference of manufacturers and bankers in Ottawa a few weeks ago. When Sir Frederick Donaldson and Gen. Mahon have completed their enquiry, it is probable that an ordnance plant will be established on the basis of a stated order from the British Government. The Canadian Government will have the opportunity of taking over the plant at the close of the period if it so desires.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Comissioners and Commercial Agents should be kept supplied with catalogues, price lists discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.

H. R. Poussette, 278 Balcarce, Buenos Aires. Cable Address, Canadian.

Australasia.

D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

British West Indies.

E. H. S. Flood, Bridgetown, Barbados, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.

J. W. Ross, 6 Kiukiang Road, Shanghai. Cable Address Canroma.

Cuba.

Acting Trade Commissioner, Lonja del Comercio, Apartado 1250, Havana. Cable address, Cantracom.

France.

Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

Japan.

G. B. Johnson, P.O. Box 100, Yokohama. Cable Address, Canadian.

Holland.

J. T. Lithgow, Zuidblaak 96, Rotterdam. Cable address, Watermill.

Newfoundland.

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.

W. A. Reddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.

W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.

E. de B. Arnaud, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

Acting Trade Commissioner, North British Building, East Parade, Leeds. Cable address, Canadian.

F. A. C. Blokerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

Fred. Dane, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

CANADIAN COMMERCIAL AGENTS.

British West Indies.

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

Colombia.

A. E. Beckwith, c-o Tracey Hines, Medellin, Colombia. Cables to Marmato, Colombia. Cable address, Canadian.

Norway and Denmark.

C. E. Sontum, Grubbegaten No. 4, Christiania, Norway. Cable address, Sontums.

South Africa.

D. M. McKibbin, Parker, Wood & Co., Buildings, P.O. Box 559, Johannesburg.

E. J. Wilkinson, Durban, 42 St. Andrew's Buildings, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Hedley, B.C.—The Daly Reduction Co. have recently installed a number of new units at their plant.

Hespeler, Ont.—The A. B. Jardine Co. will enlarge their plant. A building 50 ft. x 60 ft. will join the machine shop and foundry.

Valleyfield, Que.—The town will loan the Castings Company of Canada $25,000. This is a new concern, which proposes making shells.

Collingwood, Ont.—There is a possibility of operations being started at the Northern Iron and Steel Works. G. Manton, of Cleveland, Ohio, is an interested party.

Sarnia, Ont.—The Sarnia Metal Products Co. has received from the British Government a war contract, which amounts to a large figure, for shell parts. New machinery to the value of $37,000 has been purchased.

Welland, Ont.—The Electro Steel Metals Co. will extend their plant. The extensions will include a machine shop, 30 ft. x 50 ft., and an office building, 40 ft. x 50 ft., two storeys high. A 6-ton electric furnace will be installed.

Woodstock, Ont.—J. D. Tindal & Son have been given the contract for the construction of an addition to William Baird's machine shop on Dundas street. The addition to be erected will be added to the present building and will be 60 ft. x 90 ft.

Montreal, Que.—The directors of the Laurentide Company have under consideration a large extension to their paper mill at Grand Mere, Que. It was stated that the output of the mill could be doubled by an expenditure of $1,500,000. Mr. Chahoon is president of the company.

Nelson, B.C.—Fred. R. Wolfle, president and general manager of the Florence Mine, states that construction work will start soon on a 200-ton daily capacity concentrator, a hydro-electric power station and compressor plant, together with extensive underground development to cost not less than $150,000.

Electrical

Doon, Ont. — A hydro-electric lighting system will be installed here.

Otterville, Ont.—A hydro-electric by-law will be submitted to the rate-payers on Nov. 5.

London, Ont.—Beattie Bros. are considering the purchase of a number of electric motors.

Owen Sound, Ont.—It is certain now that the power from Eugenia will be turned into Owen Sound by December 1. Construction Engineer A. S. Robertson has arrived here and is busy installing the three transformers, which will carry 1,500 horse-power. The new hydro building is almost completed and the machinery will be installed as rapidly as possible.

Municipal

Renfrew, Ont.—The town council are considering the question of obtaining more power for local industries.

Georgetown, Ont.—It is proposed to loan Henry Corke $6,000 to assist in establishing and operating a woolen mill.

Lindsay, Ont.—The town council has been successful in renting the balance of the Sylvester plant not used for shell-making to the Lindsay Wood-Working Co.

Brantford, Ont.—The city council has purchased from the Waterous Engine Works for $7,100, a combination auto hose and chemical wagon for the fire department.

Port Coquitlam, B.C.—The construction of a waterworks system is contemplated by the City Council at an estimated cost of $35,000. A by-law will be voted on.

Montreal, Que.—The Board of Control are considering the construction of an incinerator, having a capacity of 500 tons per day. The cost is estimated at $200,000.

Hamilton, Ont.—The city council is considering the establishment of a steam power plant, as a reserve, at the pumping station, as an alternative to using hydro electric power for this purpose.

Sherbrooke, Que.—The council have engaged M. A. Sammett, an electrical engineer, to make a report as to the best means of increasing the power production to meet the demands of local industries.

Penetang, Ont.—A by-law will be voted on by the ratepayers on Nov. 8 to raise $3,500 for water main extensions.

Sarnia, Ont.—Engineer Latour, of Toronto, who is to undertake to get a plentiful supply of pure water for the new Sarnia waterworks, has completed his plans, and will start work at the new plant as soon as the contract with the city is signed. The work will, it is estimated, cost the city about $3,000.

General Industrial

Camrose, Alta.—Work has started on the new Palleson creamery.

Toronto, Ont.—The Langmuir Mfg. Co., leather goods, will build an addition to their factory.

Southey, Sask.—A big fire occurred at Markinch on Oct. 27, when the Maple Leaf elevator, which contains about 15,000 bushels of wheat, was totally destroyed.

Halifax, N.S.—The paper mill of the MacLeod Pulp & Paper Co., situated at Milton, near Liverpool, N.S., and valued at about $250,000, was totally destroyed by fire last Monday.

Winnipeg, Man.—Owing to the rapidly increasing business, the Robin Hood Milling Co. are planning erecting more mills in the West. George A. Bean, of Minneapolis, is president of the company.

Chatham, Ont.—A deal is on for the sale of the Defiance Ironworks, on Lacroix Street, by the city to a concern in Illinois, and a committee has been appointed to leave immediately for the States to close the deal.

Kincardine, Ont.—The new knitting mill has been completed, and at a special meeting of the town council the agreement between the Circle Bar Knitting Co. and the town was ratified. The latter has made a loan to the company of $15,000, to be paid back in annual installments. Between $30,000 and $40,000 is being invested in the new concern.

Wood-Working

Meaford, Ont.—The W. A. Moore Co. are disposing of their woodworking plant.

Tillsonburg, Ont.—A large auto firm of Detroit is negotiating with the directors of the Tillsonburg Electric Car Co., regarding securing its building for the purpose of manufacturing auto bodies.

Tenders

Toronto, Ont.—Tenders for lead covered cable, addressed to the chairman of the Toronto Electric Commissioners, will be received until Tuesday, November 16, 1915. Specifications and form of tender can be obtained at the office of the purchasing agent, 15 Wilton Avenue.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, up to Tuesday, November 9, 1915, for the supply of a radial drill for machine shop, Danforth Avenue car barns. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders for all trades required in connection with the erection of an incinerator building, bridges, etc., on the Don Roadway, will be received up to Tuesday, November 9. Plans and specifications may be seen and forms of tender and all information obtained at the office of the city architect, City Hall, Toronto.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, November 9, 1915, for the supply and erection of valves, steam piping, special steel castings and lagging, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Ottawa, Ont.—Tenders will be received until Wednesday, November 10, 1915, for the construction of steel gates, towers and operating machinery for the regulating dam, Big Chaudiere Falls, French River, Ont. Plans and form of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers, Confederation Life Building, Toronto, and Shaughnessy Building, Montreal.

Ottawa, Ont.—Tenders will be received up to Tuesday, November the 23rd, for the undermentioned items for delivery to H.M.C. Dockyards at Halifax, N.S., and Esquimalt, B.C.: Steel and iron bolts, nuts and rivets, electric cable and wire, mineral grease, castile soap, hard soap, turpentine, chemicals, cleansing powder, bunting. Forms of tender and all information may be obtained by application to the Naval Store officer at H.M.C. Dockyards at Halifax, N.S., or Esquimalt, B.C., or to G. J. Desbarats, Deputy Minister of the Naval Service, Ottawa.

Contracts Awarded

Sherbrooke, Que.—The city council have awarded a contract for cast iron pipe to Codere & Sons Co.

Windsor, Ont.—The contract to install a new Scotch boiler in the waterworks has been awarded the International Engine Works, Montreal. The boiler, including installation, will cost about $5,000.

Toronto, Ont.—The Board of Control has awarded the contract to the Northern Crane Works, Ltd., for the supply and erection of an electric crane, hoist and single line clam shell bucket at the main sewage disposal works, for $3,580.

Personal

H. V. Armstrong, B.A.Sc., for several years town engineer of Estevan, Sask., has resigned.

H. Sydney Hancock, Junr., formerly city engineer of Fort William, Ont., has left for England.

H. T. Jackson, of Montreal, has been appointed to the position of manager of the Record Foundry & Machine Co., Moncton, N.B.

Lieut. Herrick Duggan of the Royal Engineers, and until recently on the staff of the Dominion Bridge Co., Lachine, Que., has been wounded in France.

David A. Thomas, representative of the British Minister of Munitions, has left Ottawa for New York on his way back to England. His work is now in the hands of Lionel Hichens.

A. W. Smithers, chairman of the Board of Directors of the Grand Trunk Railway System, has arrived in Montreal from London, England, to consult with President E. J. Chamberlin. Mr. Smithers will not make his customary visit to the Coast.

P. Gifkins, general manager of the Dominion Atlantic Railway for the past fifteen years, and associated with the company for forty-four years, has retired. George E. Graham is the new general manager, with headquarters at Kentville, N. S. The change takes effect on November 1.

Geo. E. Graham, formerly superintendent of the British Columbia division of the C.P.R., and for the past two years general manager of the Coquitlam Terminal Co., has been appointed general manager of the Dominion Atlantic Railway, a subsidiary line of the C.P.R., operating in the Maritime Provinces.

Capt. Leon H. Curry of the 42nd Royal Highlanders, of Montreal, was killed in action recently in Northern France. Capt. Curry was born at Amherst, N.S., 30 years ago. About three years ago he was appointed assistant to the vice-president and general manager of the Canadian Steel Foundries, Montreal, Que.

Sir Charles Tupper, Bart., K.C.M.G., died in London, England, on Oct. 30, at the age of 94. Sir Charles was born at Amherst, N.S., on July 2, 1821, and in 1855 entered upon his public career. He was appointed Minister of Public Works in 1878, in the MacDonald Administration and afterwards he created the Department of Railways and Canals, and was its first Minister. It was while Minister of Railways and Canals that he carried out important works in connection with the enlargement of the Welland Canal, the deepening of the St. Lawrence, and the construction by private company of the Canadian Pacific Railway. Sir Charles Tupper was created a K.C.M.G. in 1879, a G. C.M.G. in 1886, a Baronet of the United Kingdom in 1888, and an Imperial Privy Councillor in 1908.

Sir Andrew Noble, Bart., K.C.B., the famous authority on artillery and explosives, and chairman of the Armstrong, Whitworth & Co., Newcastle-on-Tyne, England, died recently. Sir Andrew was born at Greenock, Scotland, in 1831. In 1860 he began his famous partnership with Lord Armstrong who had established a plant for making ordnance at Elswick. Later on the firm amalgamated with the Whitworth Co., the new concern being known as Armstrong, Whitworth & Co., which has developed into one of the greatest industrial establishments in the world. Sir Andrew received many honors. He was created a C. B. in 1881, and K. C. B. in 1893, and a Baronet of the United Kingdom in 1902. In 1870 he was elected a Fellow of the Royal Society; and in 1880 received the Royal Medal of that Society. He was a Knight of various foreign orders, and was honored by many learned and scientific bodies.

Trade Gossip

The Algoma Steel Co., of Sault Ste. Marie, Ont., has contracted to supply 30,000 tons of steel rounds to Great Britain. The company is also said to have closed orders for 20,000 additional rounds.

The Windsor Brass Foundry Co., Windsor, Ont., have purchased the Cana-

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Advertising

"Advertising is the education of the public as to who you are, where you are, and what you have to offer in the way of skill, talent or commodity. The only man who should not advertise is the man who has nothing to offer the world in the way of commodity or service."—*Elbert Hubbard.*

dian manufacturing rights of the Harvey valve. The company are also putting on the market the "Bradley" auto sleeper.

Arnold Thompson, chief inspector and late foreman toolmaker with the Canadian Allis-Chalmers, Toronto, has resigned his position and will take over the Tobin Arms Factory at Woodstock, Ont. The firm will be known as the Arnold Thompson Tool Co., and the product will be jigs, tools and gauges, etc.

Montreal, Que.—A new subsidiary of the Dominion Bridge Co., of Lachine, Que., has just been incorporated at Ottawa, its purpose being to take up the manufacturing of brass discs for cartridge cases and copper bands for shells, an entirely new enterprise in Canada. The promoters of the new concern are G. H. Duggan and H. H. Vaughan, of the Montreal Ammunition Co. The Company is capitalized at $300,000 and the factory will be at Montreal.

Industrial Conditions Much Better.—A most gratifying report has been prepared by W. D. Lightall, secretary of the Union of Canadian Municipalities. It was to the effect that after a thorough investigation into unemployment problems in all parts of the country, it would be unnecessary to call a Dominion-wide convention to discuss what could be done to help conditions. Most of the places, Mr. Lightall says, will be quite able to look after their own unemployed this year.

McLaughlin Carriage Co.—The deal between the Carriage Factories, Ltd., and the McLaughlin Carriage Co., of Oshawa, whereby the former concern takes over the entire carriage end of the McLaughlins has been closed. The McLaughlins will give their entire attention to the automobile trade. It is said that Carriage Factories, which is a Brockville concern, has secured the business on exceptionally favorable terms. The McLaughlin Company has secured the Canadian agency of the Chevrolet motor car, and this enlarged business will demand the company's energies formerly given to carriage manufacture.

New Incorporations

The Casey-Harris Mining Co., has been incorporated with a capital of $100,000, to acquire and develop mineral lands and deposits. Head office at Toronto.

The Diaphone Signal Company, has been incorporated at Ottawa with a capital of $825,000, to manufacture all kinds of signalling devices, at Toronto. Incorporators: Gideon Grant and Bruce Williams, both of Toronto.

If what you want is not advertised in this issue consult the Buyers' Directory at the back

Renown Engine & Machine Co., has been incorporated at Ottawa with a capital of $50,000, to manufacture machinery of all kinds and war munitions, at Montreal. Incorporators: Alexander Ronald Johnson and Arthur Ross, of Montreal.

The Canadian Gahagan Construction Co., has been incorporated at Ottawa with a capital of $100,000 to carry on the business of general contractors, engineers, at Toronto. Incorporators: John Shirley Denison and Frank James Foley, of Toronto.

The Lachance Nut Lock Co., has been incorporated at Ottawa with a capital of $300,000, to manufacture the "Lachance" nut lock and other devices, at Montreal, Que. Incorporators: Joseph Alphones Bilodeau and Maurice Loranger, of Montreal.

The National Steel Products, has been incorporated at Ottawa with a capital of $100,000, to manufacture munitions, explosives, projectiles, shells, aeroplanes, guns and gun carriages, at Toronto, Ont. Incorporators: Thomas Gibson and Joseph Garfield Gibson, of Toronto.

The Eastern Machinery Co., of Montreal, has been incorporated at Ottawa with a capital of $45,000 to carry on the business of machinists, mechanical, electrical and civil engineers, at Montreal. Incorporators: Armand Lalonde and Emile Alphonse Lalonde, both of Montreal.

Steel and Radiation, Ltd., has been incorporated at Ottawa with a capital of $5,000,000, to manufacture iron, steel and other metals and to carry on the business of an engineering and construction company, at Toronto. Incorporators: James Steller Lovell, Robert Gowans and John Joseph Dashwood.

Catalogues

Safety Valves—The James Morrison Brass Mfg. Co., Toronto, have issued a bulletin illustrating and describing their line of safety valves for high and low pressures and super-heat steam. A price list is included for the various types.

Murphy, Stearman & Co., 180 Gray's Inn Road, London, England, have sent us a copy of their new catalogue. The goods dealt with are all British made and embrace complete equipment for foundries and machine shops, and many other lines for engineers and contractors.

The Canadian Allis-Chalmers, Ltd., Toronto, have issued a bulletin No. 1633 which describes a test of a low head hydraulic power plant at the Grand Rapids, Wis., station of the Centralia Pulp &

Water Co. The test gives some interesting data on hydro-electric plant operation, including a series of velocity curves.

Reducing Valves, made by the James Morrison Brass Mfg. Co., Toronto, Ont., are described fully in a folder recently issued. A sectional view is shown of the J. M. T. reducing valve, which is followed by a description covering the method of operation, and also directions for installing and cleaning. A price list is included, giving weights and dimensions of the various sizes.

Foundry Equipment. The National Engineering Co. of Chicago, Ill., have issued a bulletin dealing with the "Simpson" intensive foundry mixer and "Simpson" national screen separator. The construction of the mixer and methods of handling various materials are fully described, while illustrations give a general idea of the machine. The screen separator is also described and illustrated.

"The Cost of Pumping Water" is the title of a collection of graphical charts with accompanying explanatory text issued by the DeLaval Steam Turbine Co., of Trenton, N.J. The object of the publication is to facilitate computation of the overall economy of different types of steam pumping units, having given the cost of fuel, steam pressure, rate of interest, cost of apparatus and other variables. The first chart shows the number of B.t.u., represented by each pound of steam for various combinations of superheat, steam pressure and feed water temperature. The second chart gives the cost of 1,000 lbs. of steam and the cost of a million B.t.u.'s in the steam from the cost of coal per ton, the heat value of the coal and the boiler efficiency. The third diagram shows the relation existing between the average cost of steam-turbine-driven centrifugal pumping units and the head pumped against. The fourth diagram shows the amount of money to be set aside yearly for sinking fund, to cover depreciation for different terms of life and rates of interest. The fifth diagram is the well known Mollier steam chart, supplemented by a convenient scale by means of which B.t.u. available per pound between given limits, the resulting velocity of steam in feet per second and the corresponding duty in foot pounds per 1,000 lbs. of steam, and the pounds of steam per h.p. hour may be read off directly. The sixth diagram is an alignment chart for determining the resistance of pipes to flow of water. Three scales represent gallons per minute, diameter of pipe in inches, and loss of head in feet per 1,000 ft. of pipe. A straight edge laid across points corresponding to known figures on two of the scales, shows the third variable by intersection with the remaining scale. At the end of the publication a list of representative municipal installations of De Laval steam-turbine-driven centrifugal pumps, from which it is to be observed that units of this type have been installed for capacities as large as 100,000,000 gallons per day and heads as great as 334 ft., and have developed duties exceeding 150,000,000 ft., lbs. per 1,000 lbs. of steam. It is also pointed out that because of the low first cost of apparatus, foundations and buildings inherent in this type of pump, the total cost of pumping water is greatly reduced as compared with the much larger, heavier and more expensive triple-expansion reciprocating pumping engines, in spite of the somewhat higher duty exhibited by the latter. Copies of the publication are offered gratis to those interested.

Book Reviews

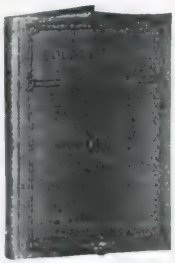
The Influence of Temperature Upon the Strength of Concrete, by A. B. McDaniel, has been issued as Bulletin No. 81 of the Engineering Experiment Station of the University of Illinois. This bulletin presents a study of the data obtained from three series of tests of concrete cubes and cylinders. These specimens were stored under temperature conditions varying from 25 deg. to 90 deg. F., and were tested at various ages up to twenty-eight days. Curves are presented to show the relation between strength and age for different temperature conditions, and also the relation between strength and temperature at different ages. The results are summarized in a set of curves which show the percentage strength of concrete at different ages and under different temperature conditions to that at an age of twenty-eight days and under a normal temperature of 70 deg. F. The results of the tests made under freezing temperature conditions are of especial interest; showing the gradual and slow gain in strength under a storage temperature slightly below freezing, and the disintegrating effect of alternate thawing and freezing temperatures. The bulletin will be of value to the contractor, engineer and others engaged or interested in construction work for information regarding the strength which may be expected of ordinary concrete under different age and temperature conditions and the time for the removal of the forms. Copies of Bulletin No. 81 may be obtained gratis upon application to W. F. M. Goss, Director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

Mechanical Engineering Books

If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.

MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine Shop Work Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price $1.50

MECHANICAL DRAWING. By Ervin Kennison, S.B., Assistant Professor of Mechanical Drawing, Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, sections, intersections and developments, lettering, etc., with abundant exercises and plates. Price $1.00



FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp., 142 illus. Cloth binding. A practical guide to modern methods of moulding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price $1.00

PATTERN MAKING. By James Ritchey, Instructor in Wood Working, Armour Institute of Technology. 100 pp., 250 illus. Cloth binding. Shows the reader how to take the blueprint and from it make the pattern for any kind of casting under any conditions. The allowances for shrinkage, draft, and finish are explained. Simple and built-up patterns of all kinds are clearly treated. Various special cases are taken up, such as pulleys, cranks, pipe connections, valves, etc. Price $1.00

MACHINE DESIGN. By Charles L. Griffin, S.B., Assistant Engineer, the Solvay Process Co., American Society of Mechanical Engineers. 208 pp., 82 designs. Cloth binding. Explains in detail how to make the entire design of all kinds of machinery, how to lay out gears, etc., with complete specimen designs of numerous machines. Price $1.50

FORGING. By John Lord Bacon, Eng. and Supt. of Construction, with R. P. Shields & Son, San Diego, Cal., American Society Mechanical Engineers. Author of "Forge Practice," 128 pp., 180 illus. Cloth binding. A working handbook of practical instruction in hammering working, forming, and tempering of wrought iron, machine steel, and tool steel, including the important modern development of electric welding. Price $1.00

TOOL MAKING. By Edward R. Markham, Consulting Mechanical Engineer, formerly Superintendent of the Waltham Watch Tool Co., American Society of Mechanical Engineers, Author of "The American Steel Worker," 224 pp., 325 illus. Cloth binding. Takes up the methods of treating tool steels—annealing, tempering, spring tempering, hardening, case hardening, etc.; how to make drills and reamers of all kinds; the making of arbors and mandrels, taps, hubs, reamer and tap-holders, jigs, gauges, dies and die-holders of all kinds, counterbores, facing tools, milling cutters, hollow mills, and forming tools. Gives all necessary information for tool making in all its branches. Price $1.50

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Can. H. W. Johns-Manville Co., Limited, Toronto.

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Lever Bros., Toronto.

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National Machinery and Supply Co., Hamilton.

Automatic Machinery.
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National Machinery & Supply Co., Hamilton.

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Baking Ovens.
Owen Equipment & Mfg. Co., New Haven, Conn.
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Bolt Cutters and Nut Taps.
Wells Brothers Co., Greenfield, Mass.

Bolts.
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.

Bolt and Nut Machinery.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas, Ont.
Owen Sound Iron Works Co., Owen Sound.
Gardner, Robt. & Son, Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
National Machinery & Supply Co., Hamilton.
Wiley & Russell Co., Greenfield, Mass.

Books.
Maclean Publishing Co., Toronto.

Boring Machines, Upright and Horizontal.
John Bertram & Sons Co., Dundas.
Colburn Machine Tool Co., Franklin, Pa.
Gardner Machine Co., Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Mosch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Stow Mfg. Co., Binghamton, N.Y.

Boring Machines, Pneumatic, Cylinder.
Baker Brothers, Toledo, O.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.

Boring and Turning Mills.
John Bertram & Sons Co., Dundas.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boxes, Annealing, Charging.
Mesta Machine Co., Pittsburg, Pa.

Box Puller.
Jardine, A. R. & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland.

Brakes.
Brown, Boggs & Co., Hamilton, Can.
Whiting Foundry Equipment Co., Harvey, Ill.

Brakes, Heavy Plate Bending and Cornice.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Brass Working Machinery.
A. R. Williams Machy. Co., Toronto.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Wagner & Swasey Co., Cleveland.
Niles-Bement-Pond Co., New York.

Brick Cars.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Brick Dryers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.

Brick Machinery.
Eastern Machinery Co., New Haven.
Sheldons, Ltd., Galt, Ont.

Bridges, Railway and Highway.
Can. Bridge Co., Walkerville, Ont.

Buckets, Clam Shell, Crab and Dump.
Whiting Foundry Equipment Co., Harvey, Ill.

Buffing and Polishing Machinery.
Canadian Hart Wheel Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Girard Machine & Tool Co., Philadelphia, Pa.
Gray Mfg. & Machine Co., Toronto.
New Britain Machine Co., New Britain, Conn.

Bulldozers.
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Mach. Corporation, Galt, Ont.
National Machinery & Supply Co., Hamilton, Ont.
Watson-Stillman Co., Aldene, N.J.

Burners, Enclosed Flame Gas.
Owen Equipment & Mfg. Co., New Haven, Conn.

Burners, Fuel, Oil and Natural Gas.
Whiting Foundry Equipment Co., Harvey, Ill.

Burring Reamers.
Wells Brothers Company, Greenfield, Mass.
Will Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Butterjac.
Wells Brothers Company, Greenfield, Mass.

Burrs, Iron and Copper.
Parmenter & Holbrook Co., Gananoque.

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
National Machinery & Supply Co., Hamilton, Ont.

Calxanna.
Toronto Iron Works, Ltd., Toronto.

Cars, Charging Box Ingot.
Mesta Machine Co., Pittsburg, Pa.

Cars, Industrial.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.
Cunningham & Son, St. Catharines, Ont.
Owen Sound Iron Works Co., Ltd., Owen Sound, Ont.
St. Lawrence Foundry, Galt, Ont.
Tallman Brass & Metal Co., Hamilton

Castings, Air Furnaces.
Wm. Tod Company, Youngstown, O.

Castings, Brass.
Cunningham & Son, St. Catharines, Ont.
Alexander Fleck, Ltd., Ottawa.
T. C. Lawrence Foundry, Galt, Ont.
Mesta Machine Co., Pittsburg, Pa.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Bronze.
Cunningham & Son, St. Catharines, Ont.
Mesta Machine Co., Pittsburg, Pa.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Copper.
Cunningham & Son, St. Catharines, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Gray Iron.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Erie Foundry Co., Erie, Pa.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Mesta Machine Co., Pittsburg, Pa.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Wm. Tod Company, Youngstown, O.

Castings, Steel Chrome and Manganese Steel.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Company, Youngstown, O.

Castings, Malleable.
Galt Malleable Iron Co., Galt.

Castings, Nickel Steel.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Mesta Machine Co., Pittsburg, Pa.

Cement, Disc Wheel.
Gardner Machine Co., Beloit, Wis.

Cement, Iron.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Shelton Metallic Filler Co., Derby, O.

Cement Machinery.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.

Centre Reamers.
Wells Brothers Co., Greenfield, Mass.

Centering Machines.
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Centrifugal Pumps.
Can. Buffalo Forge Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

Chain Blocks.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton.

Chains, Silent and Transmission.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Plessisville Foundry, Plessisville, Que.

Chemists.
Can. Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Ltd., Toronto.

Chucks, Aero, Automatic.
Garvin Machine Co., New York.

Chucks, Drill, Lathe and Universal.
John Bertram & Sons Co., Dundas, Ont.
Buffalo Forge Co., Buffalo, N.Y.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Cushman Chuck Co., Hartford, Conn.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Wells Brothers Co., Greenfield, Mass.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
National Machinery & Supply Co., Hamilton.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Chucks, Drill, Automatic and Keyless.
Buffalo Forge Co., Buffalo, N.Y.

Chucks, Ring Wheel.
Gardner Machine Co., Beloit, Wis.

Chucking Machines.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Turner Machine Co., Danbury, Conn.
Warner & Swasey Co., Cleveland, O.

Clocks, Time and Watchman's.
Lintz-Porter Co., Toronto.

Cloth and Wool Dryers.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Sheldons, Limited, Galt.

Clutches.
Eastern Machinery Co., New Haven, Conn.
Jones & Glassco, Montreal.
Owen Sound Iron Works Co., Owen Sound.
Positive Clutch & Pulley Works, Ltd., Toronto.

Coal Handling Machinery.
Whiting Foundry Equipment Co., Harvey, Ill.

Coke and Coal.
Hanna & Co., M. A., Cleveland, O.

Collectors, Pneumatic.
Can. Buffalo Forge Co., Montreal.
Sheldons, Limited, Galt.

Compressors, Air.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.
Mesta Machine Co., Pittsburg, Pa.
National Machinery & Supply Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.

Concentrating Plant.
Gardner, Robt., & Son, Montreal.

Concrete Mixers.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton.

Concrete Reinforcement.
Canada Wire Goods Mfg. Co., Hamilton.

Condensers.
Can. Buffalo Forge Co., Montreal.
Mesta Machine Co., Pittsburg, Pa.
The Smart-Turner Machine Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.

Contracting Engineers, Electrical
Lintz-Porter Co., Toronto.

Controllers and Starters, Electric Motor.
A. R. Williams Machy. Co., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Conveyor Machinery.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.

Coping Machines.
Can. Buffalo Forge Co., Montreal.
John Bertram & Sons Co., Dundas.
National Machinery & Supply Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Cornice Brakes.
Brown Boggs Co., Ltd., Hamilton, Canada.
Steel Bending Brake Wks., Chatham.

Counting Machines.
W. N. Durant Co., Milwaukee, Wis.
National Scale Co., Chicopee Falls, Mass.
C. J. Root Co., Bristol, Conn.

Counterbores and Countersinks.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Countershafts.
Baird Machine Co., Bridgeport, Conn.
Wells Bros. Co., Greenfield, Mass.

Country House Lighting and Cooking.
Can. Blaugas Co., Montreal.

Couplings.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Eastern Machinery Co., New Haven, Conn.
Gardner, Robt., & Son, Montreal.
Owen Sound Iron Works Co., Owen Sound, Ont.

Couplings, Air Hose.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Crabs, Travelling.
Owen Sound Iron Works Co., Owen Sound.

Cranes, Locomotive.
Northern Crane Works, Walkerville.

Cranes, Gantry.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Goliath.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Cranes, Pneumatic.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Post Jib.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Portable.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Swing Jib.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Transfer.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Wall.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Travelling Electric and Hand Power.
Dominion Bridge Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Crane, Chain.
Northern Crane Works, Walkerville.

Cranes, All Kinds.
Northern Crane Works, Walkerville.
Owen Sound Iron Works Co., Owen Sound, Ont.
Southwork Foundry & Machine Co., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.
Niles-Bement-Pond Co., New York.

Crimps, Leather.
Graton & Knight Mfg. Co., Montreal.

Cupolas.
Can. Buffalo Forge Co., Montreal.
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola and Blast Gate Blowers.
Can. Sirocco Co., Ltd., Windsor, Ont.

Cupola Blast Gauges & Blowers.
Sheldons, Ltd., Galt, Ont.

Cutters, Angle, Tee Iron and Bar.
Can. Buffalo Forge Co., Montreal.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Cutters, Pipe.
Can. Fairbanks-Morse Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Trimont Mfg. Co., Roxbury, Mass.

Cutting Compound & Cutting Oil.
Can. Economic Lubricant Co., Montreal.
Can. Oil Companies, Toronto.
Cataract Refining Co., Buffalo, N.Y.
Crescent Oil Co., New York.
Racine Tool & Machine Co., Racine, Wis.

Cutter Grinders and Attachments
Cincinnati Milling Machine Co., Cincinnati.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.

Cutters, Milling.
A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Morse Twist Drill and Machine Co., New Bedford.
Tabor Mfg. Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Geo. Gorton Machine Co., Racine, Wis.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Nutter & Barnes Co., Hinsdale, N.H.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Can. Fairbanks-Morse Co., Montreal.

Derricks.
Dominion Bridge Co., Montreal.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Designers, Special Machinery.
Baird Machine Co., Bridgeport, Conn.

Dies and Die Stocks.
Armstrong Mfg. Co., Bridgeport, Conn.
Banfield, W. H. & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs & Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Gardner, Robt., & Son, Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wiley & Russell, Greenfield, Mass.

Dies for Bit Brace Use.
Wells Brothers Co., Greenfield, Mass.

Die Sinkers.
Garvin Machine Co., New York.

Dies for Machines.
Wells Brothers Co., Greenfield, Mass.

Die Sinking Presses, Hydraulic.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Dies, Self-opening.
Duncan Electrical Co., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit

Dies, Opening.
W. H. Banfield & Sons, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.

Dies for Screw Plates.
Wells Brothers Co., Greenfield, Mass.

Dies, Sheet Metal Working.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

Dies, Screws and Thread.
Armstrong Mfg. Co., Bridgeport, Conn.
Greenfield Tap & Die Corporation Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.

Discs, Leather.
Graton & Knight Mfg. Co., Montreal.

Draughtsman's Tools.
Emmert Mfg. Co., Waynesboro, Pa.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Windsor, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Limited, Galt, Ont.

Drift Bolt Cutters.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drill Presses.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
A. R. Williams Machinery Co., Toronto.

Drilling Machines, Locomotive and Multiple Spindle
Amalgamated Machy. Corporation. Chicago, Ill
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Garlock Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial and Turret.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Sensitive.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Rockford Machine Tool Co., Rockford, Ill.

Drilling Machines, Upright and Horizontal.
Amalgamated Machy. Corporation, Chicago, Ill.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Colburn Mach. Tool Co., Franklin, Pa.
A. R. Williams Machy. Co., Toronto
W. F. & John Barnes Co., Rockford.
John Bertram & Sons Co., Dundas.
Garlock Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Rockford Machine Tool Co., Rockford.
R. McDougall Co., Galt.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.

Drilling Posts.
Keystone Mfg. Co., Buffalo, N.Y.

Drills, Bench.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

Drills, Blacksmith and Bit Stock.
Can. Buffalo Forge Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Centre.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co. New Bedford.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills Corner (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drills, Electric and Portable.
A. R. Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Niles-Bement-Pond Co., New York.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

Drills, High Speed.
Baker Bros., Toledo, O.
Cleveland Twist Drill Co., Cleveland.
Can. Fairbanks-Morse Co., Montreal.
Morse Twist Drill and Machine Co., New Bedford.
W. F. & John Barnes Co., Rockford, Ill.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Multiple Spindle.
Pratt & Whitney Co., Dundas, Ont.
Niles-Bement-Pond Co., New York.

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co. New Bedford.

Drills, Pneumatic.
John F. Allen Co., New York.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.
Armstrong Bros. Tool Co., Chicago.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, Rock.
A. R. Williams Machy. Co., Toronto.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drills, Track.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, Twist.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
John Morrow Screw Co., Ingersoll, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drill Holders.
Wells Brothers Co., Greenfield, Mass.

Drill Sockets.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drying Appliances.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.

Drying Out Barrels.
Baird Machine Co., Bridgeport, Conn.

Drying Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Dump Cars.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.

Dust Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Dust Arresters (for Tumbling Mills).
Whiting Foundry Equipment Co., Harvey, Ill.

Dynamos and Electrical Supplies.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Electrical Supplies.
Duncan Electrical Co., Montreal.
Lintz-Porter Co., Toronto.

Elevator Enclosures.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London Ont.

Elevating and Conveying Machinery.
Can. Mathews Gravity Co., Toronto.
Plessisville Foundry, Plessisville, Que.

Emery Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

Emery and Emery Wheels.
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Hamilton, Ont.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Emery Wheels, Dressers and Stands.
Canadian Hart Wheels, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
National Machinery & Supply Co. Hamilton, Ont.
Norton Co., Worcester, Mass.

Emery Wheel Safety Flanges.
Canadian Hart Wheels, Hamilton, Ont.

Enameling Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Engines, Corliss, Compound, Pumping.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Company, Youngstown, O.

Engines, Gas and Gasoline.
Can. Fairbanks-Morse Co., Montreal.
Jones & Glasseo Montreal.
Mesta Machine Co., Pittsburg, Pa.
National Machinery & Supply Co., Hamilton.
Wm. Tod Company, Youngstown, O.

Engines, Horizontal and Vertical.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd. Windsor Ont.
Mesta Machine Co., Pittsburg, Pa.
A. R. Williams Machy. Co., Toronto.
Sheldons, Ltd., Galt, Ont.
Wm. Tod Co., Youngstown, O.

Engines, High-Speed, Automatic.
Can. Buffalo Forge Co., Montreal.

Engines, Steam.
Can. Buffalo Forge Co., Montreal.
Mesta Machine Co., Pittsburg, Pa.
Plessisville Foundry, Plessisville, Que.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Company, Youngstown, O.

Engines, Stationary and Marine.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Engineering Books.
The MacLean Publishing Co., Ltd., Toronto.

Engraving Machines.
Geo. Gorton Machine Co., Racine, Wis.

Elevators and Buckets.
Eastern Machinery Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Equipment Shop.
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Wm. Tod Co., Youngstown, O.

Escutcheon Pins.
Parmenter & Bulloch Co., Gananoque.

Evaporators' Machinery.
Brown, Boggs & Co. Hamilton, Can.

Exhaust Heads and Hoods.
Can. Buffalo Forge Co., Montreal.
Can. Steel Products Co., Montreal.
Can. Fairbanks Morse Co., Montreal.
Sheldons, Ltd. Galt Ont.

Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd. Windsor, Ont.

Experimental Machinery.
Owen Sound Iron Works Co., Owen Sound.

Extractors, Ingot.
Mesta Machine Co., Pittsburg, Pa.

Fans.
Can. Buffalo Forge Co., Berlin, Ont.
Baird Machine Co., Bridgeport, Conn.
Can. Sirocco Co., Ltd., Windsor, Ont.
Lintz-Porter Co., Toronto.
Plessisville Foundry, Plessisville, Que.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

Feed Water Heaters.
Can. Fairbanks-Morse Co., Montreal.
The Smart-Turner Machine Co., Hamilton.

Fence, Iron Factory.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.
Standard Tube & Fence Co., Woodstock, Ont.

Files.
Delta File Works, Philadelphia, Pa.
Nicholson File Co., Port Hope, Ont.

Fire Alarm Apparatus.
Lintz-Porter Co., Toronto.

Fire Brick.
Elk Fire Brick Co., Hamilton, Ont.

Fire Extinguishers.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Fire Escapes.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Flash Lamps.
Lintz-Porter Co., Toronto.

Flexible Shafts.
Chicago Flexible Shaft Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.

Flumes.
Toronto Iron Works, Ltd., Toronto.

Foot Valves.
Smart-Turner Mach. Co., Hamilton.

Forges, Hand, etc.
Can. Buffalo Forge Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
National Machinery & Supply Co., Hamilton.
Sheldons, Limited, Galt, Ont.

Forgings, Drop, Automobile and Locomotive.
Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.
Mesta Machine Co., Pittsburg, Pa.
J. H. Williams Co., Brooklyn, N.Y.

Forging Hammers, Belt-Driven.
Bliss, E. W., Co., Brooklyn, N.Y.
Plessisville Foundry, Plessisville, Que.

Forging Hammers, Steam.
Erie Foundry Co., Erie, Pa.

Forging Machinery.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton Canada.
National Machinery Co., Tiffin, Ohio.
Plessisville Foundry, Plessisville, Que.
Wm. Tod Company, Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Foundry Equipment.
Northern Crane Works, Walkerville.
W. W. Sly Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Friction Leathers.
Graton & Knight Mfg. Co., Montreal.

Friction Clutch Pulleys, etc.
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Eastern Machinery Co., New Haven, Conn.
Owen Sound Iron Works Co., Owen Sound.
Positive Clutch & Pulley Works, Toronto.

Furnace Engineers and Contractors.
Mechanical Engineering Co., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Blast.
Toronto Iron Works, Ltd., Toronto.

Furnaces, Oil, Coal, Gas and Electric.
Canadian Hoskins, Limited, Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Steel Heating and Brass Melting.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co Harvey, Ill.

Furnaces, Heat Treating, Hardening and Tempering.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Forging.
Mechanical Engineering Co., Montreal.
Whiting Foundry Equipment Co. Harvey, Ill.

Furnaces, Annealing, etc.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces for Baking, Bluing, Drying, Enameling, Japanning and Lacquering.
Mechanical Engineering Co., Montreal.
Oven Equipment & Mfg. Co., New Haven, Conn.

Furnace Lining.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Mechanical Engineering Co., Montreal.

Fuse Cap Machinery.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Gang Planer Tools.
Armstrong Bros. Tool Co., Chicago.

Gaskets, Leather, etc.
Graton & Knight Mfg. Co., Montreal
Can. H. W. Johns-Manville Co., Limited, Toronto.

Gas Blowers and Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Limited, Galt.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Gas Burners.
Oven Equipment & Mfg. Co., New Haven, Conn.

Gas Machines.
Brown, Boggs & Co., Hamilton, Can

Gas Producer Plants.
Can. Fairbanks-Morse Co., Montreal.

Gauges, Hydraulic Pressure.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Gauges, Standard.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Holden-Morgan Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
Garvin Machine Co., New York.
National Machinery & Supply Co., Hamilton.
Southwark Foundry & Machine Co. Philadelphia.

Gear-Cutting Machinery.
Girard Machine & Tool Co., Philadelphia, Pa.
Hamilton Gear & Machine Co., Toronto.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Sheldons, Limited, Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Wm. Tod Co., Youngstown, O.
D. E. Whiton Machine Co., New London, Conn.

Gears, Cut, Mortise, Angle, Worm.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Jones & Glasco, Montreal, P.Q.
Mesta Machine Co., Pittsburg, Pa.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.
Wm. Tod Co., Youngstown, O.

Gears, Rawhide.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Jones & Glasco, Montreal, P.Q.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

Generators, Electric.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo and Motor Co. Ltd., Toronto.
Toronto and Hamilton Electric Co., Hamilton.

Grain for Polishing.
Norton Co., Worcester, Mass.

Graphite.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Jos. Dixon Crucible Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Grinders, Automatic Knife.
W. H. Banfield & Son, Toronto.

Grinders, Centre, Pedestal and Bench.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Ford-Smith Machine Co., Hamilton.
Foss & Hill Machy. Co., Montreal.
Gray Mfg & Machine Co., Toronto.
Niles-Rement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co. New Bedford.
New Britain Machine Co., New Britain, Conn.
Norton Grinding Co., Worcester, Mass.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

Grinders, Cutter.
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., Dundas, Ont.

Grinders, Die Chaser.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.

Grinders, Disk.
Armstrong Bros. Tool Co., Chicago, Ill
Gardner Machine Co., Beloit, Wis.
Norton Grinding Co., Worcester, Mass.

Grinders, Drill.
Garvin Machine Co., New York.
United States Electric Tool Co., Cincinnati, O.

Grinders, Cylinder, Internal.
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Girard Machine & Tool Co., Philadelphia Pa
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Norton Grinding Co., Worcester, Mass.
Rivett Lathe & Grinder Co., Boston, Mass.

Grinders, Electric.
Lintz-Porter Co., Toronto.

Grinders, Pneumatic.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

Grinders, Portable, Electric, Hand, Tool, Post, Floor and Bench.
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Hisey-Wolf Machine Co., Cincinnati O.
Landis Tool Co., Waynesboro, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Norton Co., Worcester, Mass.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machy. Co., Toronto.

Grinders, Swing, Portable, Electric.
Hisey-Wolf Machine Co., Cincinnati, O.
United States Electrical Tool Co., Cincinnati.

Grinders, Tool and Holders.
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co. Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.

Grinders, Universal, Plain.
Girard Machine & Tool Co., Philadelphia, Pa.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.

Grinders, Vertical Surface.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.

Grinding and Polishing Machines, Portable, Pneumatic and Spring Frame.
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Gray Mfg. & Machine Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co. Cleveland, O.
Niles-Rement-Pond Co., New York.
Norton Co., Worcester, Mass.
Stow Mfg. Co., Binghamton, N.Y.

Grinding Wheels.
Can. Fairbanks-Morse Co., Montreal
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Carborundum Co., Niagara Falls.
Ford-Smith Machine Co., Hamilton, Canada.
Gray Mfg. & Machine Co., Toronto
Norton Co., Worcester, Mass.

Guards, Window and Machine.
Canada Wire & Iron Goods Co., Hamilton, Ont
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Hack Saw Blades.
E. C. Atkins & Co., Hamilton, Ont.
Victor Saw Works, Ltd., Hamilton Canada.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.

Hack Saw Frames.
Ford-Smith Machine Co., Hamilton, Canada.
Garvin Machine Co., New York City.
Mussens, Limited, Montreal.

Hammer High Speed.
High Speed Hammer Co., Rochester, N.Y.

Hammers, Drop and Belt Driven.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton Canada.
Canadian Billings & Spencer, Ltd., Welland.
A. R. Jardine & Co., Hespeler, Ont.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Rement-Pond Co., New York.
Plessisville Foundry, Plessisville, Que.
Toledo Machine & Tool Co., Toledo.

Hammers, Helve Power.
West Tire Setter Co., Rochester, N.Y.

Hammers, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.

Hammers, Steam.
John Bertram & Sons Co., Dundas.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Rement-Pond Co., New York.

Hand Hoists & Trolleys.
Whiting Foundry Equipment Co., Harvey, Ill.

Hand Leathers or Pads.
Graton & Knight Mfg. Co., Montreal.

Hangers.
Baird Machine Co., Bridgeport, Conn
Gardner, Robt., & Son, Montreal
The Smart-Turner Machine Co., Hamilton.

Hardness Testing Instruments
Shore Instrument & Mfg. Co., New York.

Heating and Ventilating Engineers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont
Sheldons, Ltd., Galt, Ont.

Heat Gauges, Hardening and Annealing.
Shore Instrument & Mfg. Co., New York.

Hide Cut.
L. S. Tarshis & Sons, Montreal

Hinge Machinery.
Baird Machine Co., Bridgeport, Conn.

Hinges.
London Bolt & Hinge Works, London, Ont.

Hoists, Hydraulic.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Hoisting and Conveying Machinery.
Northern Crane Works, Walkerville.
Owen Sound Iron Works Co., Owen Sound.
Southwark Foundry & Machine Co., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Chain, Electric and Pneumatic.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co. Harvey, Ill.

Hoists, Electric.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co. Harvey, Ill.

Hoppers.
Toronto Iron Works, Ltd., Toronto.

Hose Clamp Tool.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Hose, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.

Hose, Steam, Suction and Water.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Holders for Dies and Drills.
Wells Brothers, Company, Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Horsehair.
L. S. Tarshis & Sons, Montreal.

Hydraulic Accumulators.
Can. Boomer & Boschert Press Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Mesta Machine Co., Pittsburgh.
Niles-Rement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
The Smart-Turner Machine Co., Hamilton
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Hydraulic Machinery.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Mesta Machine Co., Pittsburgh.
Niles-Rement-Pond Co., New York.
National Machinery & Supply Co., Hamilton.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Co., Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Indicators, Speed.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

Index Centres.
Fred. C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

Ingot Metals.
A. C. Leslie & Co., Ltd., Montreal.

Intensifiers.
Mesta Machine Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia.

Iron Filler.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Iron Ore.
Hanna & Co., M. A., Cleveland, O.

Jacks, Hydraulic.
Charles F. Elmes Eng. Works, Chicago
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Jacks.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Plessisville Foundry, Plessisville, Que.

Jacks, Pneumatic.
Northern Crane Works, Walkerville.

Jacks, Pit and Track.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Watson-Stillman Co., Aldene, N.J.

Japanning Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Jaws, Face Plate.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

Jigs, Tools, etc.
Hamilton Gear & Machine Co., Toronto.

Key Seaters.
Baker Bros., Toledo, O.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.

Kilns.
Can. Buffalo Forge Co., Montreal.
Sheldons, Limited, Galt, Ont.

Laboratories, Inspection and Testing.
Can. Inspection & Testing Laboratories, Ltd., Montreal.

Lacquering Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Ladles, Foundry.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Lag Screw Gimlet Pointers.
National Machy. Co., Tiffin, Ohio.

Lamps, Arc and Incandescent.
Can. Fairbanks-Morse Co., Montreal.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Ker & Goodwin, Brantford.

Lamps, Tungsten.
Lintz-Porter Co., Toronto.

Lathe Chucks.
Ker & Goodwin, Brantford.

Lathe Attachment for Shells.
Lymburner, Ltd., Montreal.

Lathes, Automatic.
Windsor Machine Co., Windsor, Vt.

Lathe Dogs and Attachments.
Armstrong Bros. Tool Co., Chicago.
Fay & Scott, Dexter, Maine.
Hendey Machine Co., Torrington, Conn.
National Forge & Tool Co., Erie, Pa.
J. H. Williams Co., Brooklyn, N.Y.

Lathes, Bench.
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.

Lathes, Band Turning.
Jenckes Machine Co., Sherbrooke, Que.

Lathes, Engine.
Amalgamated Machy. Corporation, Chicago, Ill.
A. R. Williams Machy. Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, O.
Fay & Scott, Dexter, Maine.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., of Chicago, Ill.
R. McDougall Co., Galt.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Lathe Pans.
New Britain Machine Co., New Britain, Conn.

Lathes, Patternmakers'.
J. G. Blount Co., Everett, Mass.
Fay & Scott, Dexter, Maine.
Foss & Hill Machy. Co., Montreal.
Garlock-Machinery, Toronto.
Mussens, Limited, Montreal.

Lathes, Roll Turning
Mesta Machine Co., Pittsburgh.

Lathes, Screw Cutting.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Cincinnati Iron & Steel Co., Cincinnati, O.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.

Lathes, Spinning.
Bliss, E. W., Co., Brooklyn, N.Y.
Toledo Mach. & Tool Co., Toledo, O.

Lathe, Turret and Speed.
John Bertram & Sons Co., Dundas.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Cincinnati Iron & Steel Co., Cincinnati, O.
Colburn Machine Tool Co., Franklin Pa.
Fay & Scott, Dexter, Maine.
Foss & Hill Machy. Co., Montreal.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
Windsor Machine Co., Windsor, Vt.
A. R. Williams Machy. Co., Toronto.

Leather Strapping.
Graton & Knight Mfg. Co., Montreal.

Lifts, Pneumatic.
Whiting Foundry Equipment Co., Harvey, Ill.

Lighting Fixtures.
Lintz-Porter Co., Toronto.

Link Belting.
Can. Fairbanks-Morse Co., Montreal.
Graton & Knight Mfg. Co., Montreal.
Jones & Glasco, Montreal.

Linoleum Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.

Liquid Air.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Lockers, Steel Wardrobe and Steel Material.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Lockers.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Locomotive Equipment.
Can. Locomotive Co., Kingston, Ont.

Locomotives, Railroading, Contracting.
Can. Locomotive Co., Kingston, Ont.
National Machinery & Supply Co., Hamilton.

Lubricants.
S. F. Bowser & Co., Fort Wayne, Ind.
Can. Economic Lubricant Co., Montreal.
Can. Oil Company, Toronto.
Canadian Refining Co., Toronto.
Crescent Oil Co., Inc., New York.

Machine Tools.
Amalgamated Machy. Corporation, Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Can. Machinery Corp., Galt, Ont.
Garlock-Machinery, Toronto.
Modern Tool Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Machinery Dealers.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Machinery, Toronto.
Hill, Clarke & Co., of Chicago.
Marshall & Huschart Machinery Co., Chicago.
National Machinery & Supply Co., Hamilton.
Frank Toomey, Inc., New York.
A. R. Williams Machy. Co. Toronto
New York Machinery Exchange, New York.

Machinery Guards.
Jones & Glasco, Montreal, P.Q.
Canada Wire & Iron Goods Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

Machinery Repairs.
Cunningham & Sons, St. Catharines, Ont.
Plessisville Foundry, Plessisville, Que.

Machinists' Scales, Small Tools and Supplies.
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.

Magnetos.
Lintz-Porter Co., Toronto.

Mandrels.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. R. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Will Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Marine Engines.
Cunningham & Sons, St. Catharines, Ont.

Marking Machinery.
Brown, Bogga Co., Hamilton, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Marquises.
Dennis Wire & Iron Works, London, Ont.

Measuring Tapes and Rules.
James Chesterman & Co., Ltd., Sheffield, Eng.

Metallurgists.
Can. Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Ltd., Toronto.

Metals.
L. S. Tarshis & Sons, Montreal.

Metal Cutting Machines.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
Racine Tool & Machine Co., Racine, Wis.

Metal Stamping.
Duncan Electrical Co., Montreal.

Meters, Electrical.
Can. H. W. Johns Manville Co., Ltd., Toronto.
Lintz-Porter Co., Toronto.

Mill Machinery.
Cunningham & Sons, St Catharines, Ont.
Alexander Fleck, Ltd., Ottawa.

Milling Attachments.
John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Cincinnati Milling Machine Co., Cincinnati.
Hendey Mach. Co., Torrington, Conn.
Kempsmith Mfg. Co. Milwaukee, W.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Milling Machines, Horizontal and Vertical.
A. R. Williams Machy. Co., Toronto.
Brown & Sharpe Mfg. Co., Providence.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
John Bertram & Sons Co., Dundas.
Foss & Hill Machy. Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Gooley & Eddind, Cortland, N.Y.
Kempsmith Mfg. Co., Milwaukee, W.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Milling Machines, Plain, Bench and Universal.
Brown & Sharpe Mfg Co., Providence, R.I.
Cincinnati Milling Machine Co., Cincinnati.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Gooley & Eddind, Cortland, N.Y.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
Mesta Machine Co., Pittsburg, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
A. R. Williams Machy. Co., Toronto.

Milling Machines, Profile.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Mesta Machine Co., Pittsburg, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

Milling Tools.
Brown & Sharpe Mfg. Co., Providence.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, W.

Mine Cars and Hitchings.
Pratt & Whitney Co., Dundas, Ont.
Modern Tool Co., Erie, Pa.
Can. Fairbanks-Morse Co., Montreal.

Mining Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Mixers, Hot Metal.
Mesta Machine Co., Pittsburg, Pa.

Mortising Machines.
Jones & Glasco, Montreal.

Motors, Electric.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co. Ltd., Toronto.
Lintz-Porter Co., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Motors, Pneumatic.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Multiple Index Centres.
Garvin Machine Co., New York.

Nipple Threading Machines.
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

Nitrogen.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Nozzles, Spray.
Can. Buffalo Forge Co., Montreal.

Nuts, Semi-Finish and Finished.
Galt Machine Screw Co., Galt, Ont.

Nut Burring Machines.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Machines (Hot).
National Machy. Co., Tiffin, O.

Nut Facing and Bolt Shaving Machines.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Tappers.
John Bertram & Sons Co., Dundas.
Garvin Machine Co., New York.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Wrenches.
Wells Brothers Co., Greenfield, Mass

Oil Separators.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., Hamilton.

Oil Stones.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

Ovens for Baking, Bluing, Drying, Enamelling, Japanning, and Lacquering.
Geo. Gorton Machine Co., Racine, Wis.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co. Harvey, Ill.

Oven Trucks, Steel.
Oven Equipment & Mfg. Co., New Haven, Conn.

Ovens for Drying, Temper and Under Trucks.
Oven Equipment & Mfg. Co., New Haven, Conn.

Oscillating Valve Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Oxy-Acetylene Welding and Cutting Plants.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Oxygen.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Packings, Leather, Hydraulics, Etc.
William R. Perrin, Ltd., Toronto.
Graton & Knight Mfg. Co., Montreal.
Southwark Foundry & Machine Co Philadelphia.

Packing, Rubber, etc.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Pans, Lathe.
Cleveland Wire Spring Co., Cleveland

Pans, Steel Shop.
Cleveland Wire Spring Co., Cleveland

Paper Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.
Can. Sirocco Co., Ltd., Windsor, Ont.

Partitions.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Patent Solicitors.
H. J. S. Dennison, Toronto.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Ross Thomson & Co., Ottawa, Ont.
Harold Shipman & Co., Ottawa.

Patterns.
Galt Malleable Iron Co., Galt.
Guelph Pattern Works, Guelph.
Hamilton Pattern & Foundry Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound, Ont.
Plessisville Foundry, Plessisville, Que.
Toronto Pattern Works, Toronto.
Wells Pattern & Machine Works, Toronto.

Patterns, Metal and Wood.
Guelph Pattern Works, Guelph, Ont.

Perforated Metals and Ornamental Iron Goods.
Canada Wire & Iron Goods Co., Hamilton.

Phosphor Bronze Castings.
Tallman Brass & Metal Co., Hamilton.

Pickling Machines
Mesta Machine Co., Pittsburgh.

Pig Iron.
Hanna & Co., M. A., Cleveland, O.
Stevens, F. B., Detroit, Mich.

Pinions, Mill Cut.
Mesta Machine Co., Pittsburg, Pa
Wm. Tod Co., Youngstown, O.

Pipe Cutting and Threading Machines.
A. R Williams Machy. Co., Toronto.
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Butterfield & Co., Rock Island ,Que.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Trimont Mfg. Co., Roxbury, Mass.
Williams Tool Co., Erie, Pa.

Pipe Cutters, Rolling.
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
John H. Hall & Sons, Ltd., Brantford, Ont.

Pipe Fittings.
Southwark Foundry & Machine Co. Philadelphia.

Pipe, Riveted Steel.
Toronto Iron Works, Ltd., Toronto.

Pipe Straightening Machines.
Watson-Stillman Co., Aldene, N.J.

Planer Drives, Electrical.
Lancashire Dynamo & Motor Co. Ltd., Toronto.
Niles-Bement-Pond Co., New York.

Planer Jacks.
Armstrong Bros. Tool Co., Chicago.

Planers, Standard and Rotary.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.

Planing and Shaping Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co, Montreal.
Fay & Scott, Dexter, Maine.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.

Planing Mill Exhausters.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Pliers.
Canadian Billings & Spencer, Ltd., Welland.

Pneumatic Tools.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Independent Pneumatic Tool Co, Chicago, New York.

Polishing Machines, Electric and Band.
Can. H. W. Johns-Manville Co., Toronto.

Portable Vise Stands.
New Britain Machine Co., New Britain, Conn.

Portable Steel Tool Racks.
New Britain Machine Co., New Britain, Conn.

Portable Steel Work Stands.
New Britain Machine Co., New Britain, Conn.

Power Plant Equipments.
Can. Fairbanks-Morse Co., Montreal.

Power Transmission.
Mesta Machine Co., Pittsburg, Pa
The Smart-Turner Mach. Co., Hamilton.

Press Screw (Adjustable).
W. F. & John Barnes Co., Rockford.
Wm. R. Perrin, Ltd., Toronto.

Presses, Bench Straightening.
Toledo Machine & Tool Co., Toledo.

Presses for Shells.
Can. Boomer & Boschert Press Co., Montreal.
Can. Locomotive Co., Kingston, Ont.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
Charles F. Elmes Eng. Works, Chicago
Foss & Hill Machy. Co., Montreal.
Goldie & McCulloch Co., Galt, Ont
Mesta Machine Co., Pittsburgh.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Watson-Stillman Co., Aldene, N.J.
West Tire Setter Co., Rochester, N.Y.

Presses, Cam, Toggle, Eyelet.
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo, O.

Presses, Broaching.
E. W. Bliss Co., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman & Co., Aldene, N.J.

Presses, Drop.
W. H. Banfield & Son, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Boomer & Boschert Press Co., Montreal.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Filter.
Lymburner, Ltd., Montreal.
Wm. R. Perrin, Ltd., Toronto.

Presses, Forging.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
Charles F. Elmes Eng. Works, Chicago, Ill.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Wm. R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Co., Youngstown, O.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Company, Youngstown, O.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Pneumatic.
Toledo Machine & Tool Co., Toledo.

Presses, Power.
Baird Machine Co., Bridgeport, Conn.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Geo. Gorton Machine Co., Racine.
Girard Machine & Tool Co., Philadelphia, Pa.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.
A. R. Williams Machy. Co., Toronto.

Presses, Scrap Baling.
Can. Boomer & Boschert Press Co., Montreal.
William R. Perrin, Ltd., Toronto.
Watson-Stillman Co., Aldene, N.J.

Presses, Spring Foot.
Baird Machine Co., Bridgeport, Conn
Toledo Machine & Tool Co., Toledo.
Brown, Boggs & Co., Hamilton, Can.

Presses, Screw.
Can. Boomer & Boschert Press Co., Montreal
Wm. R. Perrin, Ltd., Toronto.

Pressure Regulators.
Can. Fairbanks-Morse Co., Montreal.

Protective Paint.
Jos. Dixon Crucible Co., Jersey City.

Pulleys.
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
D. K. McLaren, Ltd., Montreal.
Positive Clutch & Pulley Works, Ltd., Toronto.
The Smart-Turner Mach. Co., Hamilton.

Pulley Machinery, Drilling and Tapping.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

Pumps, Air.
Mesta Machine Co., Pittsburg, Pa.
Smart-Turner Mach. Co., Hamilton.

Pumps, High Pressure.
Charles F. Elmes Eng. Works, Chicago
William R. Perrin, Ltd., Toronto.
Smart-Turner Mach. Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Pumping Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Darling Brothers, Montreal.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
Wm. R. Perrin Co., Toronto.
The Smart-Turner Mach. Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.

Pumps, all Kinds.
Can. Buffalo Forge Co., Montreal.
Charles F. Elmes Eng. Works, Chicago
Darling Brothers, Montreal.
Owen Sound Iron Works Co., Owen Sound.
William R. Perrin, Ltd., Toronto.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Watson-Stillman Co., Aldene, N.J.

Pumps, Electrically Driven.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
The Smart-Turner Mach. Co., Hamilton.

Pumps. Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Darling Brothers, Montreal.
Smart-Turner Mach. Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. R. Perrin, Ltd., Toronto.
Wm. Tod Co., Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Pumps for Oiling Systems.
S. F. Bowser & Co., Fort Wayne, Ind.

Pumps, Steam.
Darling Brothers, Montreal.
Smart-Turner Mach. Co., Hamilton.
Wm. Tod Company, Youngstown, O.

Pump Leathers.
Graton & Knight Mfg. Co., Montreal.
Southwark Foundry & Machine Co., Philadelphia.

Punches and Dies.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Scott Bros., Halifax, Eng.
Gardner, Robt., & Son, Montreal.
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

Punches, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton Canada.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Watson-Stillman Co., Aldene, N.J.

Punches, Pneumatic.
Jno. F. Allen Co., New York.

Punching Machines, Horizontal.
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton Canada.
Long & Alstatter Co., Hamilton Ohio.
Niles-Bement-Pond Co., New York.

Pyrometers.
Canadian Hoskins, Limited, Walkerville, Ont.
Shore Instrument & Mfg. Co., New York City.
Thwing Instrument Co., Philadelphia, Pa.

Quartering Machines.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

Ratchet Wrenches.
Wells Brothers Co., Greenfield, Mass.

Railing, Iron and Brass.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada

Rail Benders.
Niles-Bement-Pond Co., New York

Railroad Tools.
Can. Fairbanks-Morse Co., Montreal
Niles-Bement-Pond Co., New York.

Railroad Tools, Hydraulic.
Watson-Stillman Co., Aldene, N.J

Rapping Plates.
Stevens, F. B., Detroit, Mich.

Ratchets.
Keystone Mfg. Co., Buffalo, N.Y.

Raw Hide Pinions.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Jones & Glasseo, Montreal.
Smart-Turner Machine Co., Hamilton, Ont.

Reamers, Adjustable.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co., Greenfield, Mass.

Reamers, Bridge, Expanding and High Speed.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.

Reamer Fluting Machines.
Garvin Machine Co., New York.

Reamers, Pipe, Cylinder and Locomotive.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reaming Machines, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Reamers, Steel Taper and Self-Feeding.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Rebuilt Machine Tools.
New York Machy. Co., New York.

Reels.
Baird Machine Co., Bridgepert, Conn.

Rheostats.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Rivet Machines.
Buffalo Forge Co., Buffalo, N.Y.
National Machinery Co., Tiffin, O.

Rivets, Tubular, Bifurcated.
Parmenter & Bulloch Co., Gananoque.

Rivets, Iron, Copper and Brass.
Parmenter & Bulloch Co., Gananoque.

Riveters, Pneumatic, Hydraulic.

Hammer, Compression.
Jno. F. Allen Co., New York.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co. of Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
National Mach. & Sup. Co., Hamilton
Niles-Bement-Pond Co., New York.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Riveting Machines, Elastic Rotary Blow.
Girard Machine & Tool Co., Philadelphia, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.
Southwark Foundry & Machine Co., Philadelphia.

Rolls, Bending.
John Bertram & Sons Co., Dundas, Ont
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.

Rolling Mill Machinery.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Co., Youngstown, O.

Roofing.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rotary Converters.
A. R. Williams Machy. Co., Toronto.
Toronto and Hamilton Electric Co., Hamilton.

Rubbers.
L. S. Tarshis & Sons, Montreal

Rubber Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rules.
Brown & Sharpe Mfg. Co., Providence, R.I.
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

Safety Set Screws.
Allen Mfg. Co., Inc., Hartford, Conn.

Sand Blasts.
Curtis Pneumatic Machinery Co., St. Louis, Mo.

Sand Blast Systems.
Whiting Foundry Equipment Co. Harvey, Ill.

Saw Blades.
Diamond Saw & Stamping Works, Buffalo, N.Y.

Saw Tables.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.

Saw Sharpening Machines.
Nutter & Barnes Co., Hinsdale, N.H.

Saw Mill Machinery.
A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt. & Son, Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
National Mach. & Sup. Co., Hamilton.
Plessisville Foundry, Plessisville, Que.

Saws, High-Speed, Friction.
Hunter Saw & Machine Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Nutter & Barnes Co., Hinsdale, N.H.

Saws, Inserted Tooth.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hack.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
L. S. Starrett Co., Athol, Mass.

Saws, Circular Metal.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hot and Cold.
Hunter Saw & Machine Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburgh.
Nutter & Barnes Co., Hinsdale, N.H.

Scleroscopes.
Shore Instrument & Mfg. Co., New York City.

Scrap Iron.
L. S. Tarshis & Sons, Montreal.

Screw Machine Products.
Wallace, Barnes Co., Bristol, Conn.

Screw Machines, Hand, Automatic.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
A. B. Jardine & Co., Hespeler.
Motch & Merryweather Machy. Co., Cleveland, O.
National Mach. & Sup. Co., Hamilton.
New Britain Machine Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto
Windsor Machine Co., Windsor, Vt.

Screw Machines, Multiple Spindle.
New Britain Machine Co., New Britain, Conn.
Windsor Machine Co., Windsor, Vt.

Screw Plates.
Butterfield & Co., Rock Island, Que.
Can. Tap & Die Co., Galt, Ont.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Wells Brothers Co., Greenfield, Mass.
Wiley & Russell Co., Greenfield, Mass.

Screw Slotters.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Set Screws, Safety.
Allen Mfg. Co., Hartford, Conn.

Second-Hand Machinery.
New York Machinery Co., New York.
Gardner, Robt. & Son, Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Gardner, Robt. & Son, Montreal.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.
Union Drawn Steel Co., Hamilton.

Shanks, Straight and Taper.
Jacobs Mfg. Co., Hartford, Conn.

Shapers.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canada Machy. Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Hendey Machine Co., Torrington, Ct.
Hill, Clarke & Co., of Chicago, Chicago, Ill.

Shafting.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Sharpening Stones.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

Shavings, Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Shearing Machines, Angle Iron, Bar and Gate.
John Bertram & Sons Co., Dundas.
Bertrams, Ltd., Edinburgh, Scotland.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler.
Long & Alstatter, Hamilton, Ohio.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, Eng.
Toledo Machine & Tool Co., Toledo.

Shears, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown Boggs Co., Ltd., Hamilton, Canada.
Buffalo Forge Co., Buffalo, N.Y.
Girard Machine & Tool Co., Philadelphia Pa.
Mesta Machine Co., Pittsburg, Pa.
National Machy. Co., Tiffin, Ohio.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, Eng.
Toledo Machine & Tool Co., Toledo.

Shears, Lever, Hydraulic.
Mesta Machine Co., Pittsburg, Pa.
Watson-Stillman Co., Aldene, N.J.

Shears, Pneumatic.
John F. Allen Co., New York.
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